MAINTENANCE DOCUMENT

FOR

AQ-1135E OPTICAL POWER METER

MP MASTER
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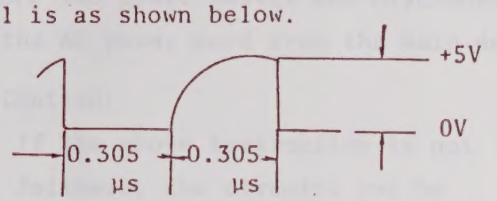
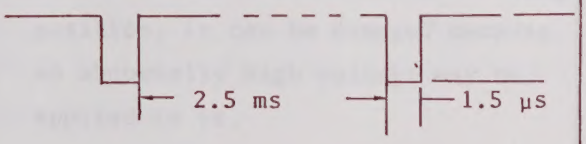
TROUBLESHOOTING GUIDE

AQ-1135E

ANDO ELECTRIC CO., LTD.

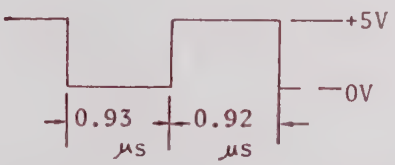
Tokyo, Japan

<table>
<tr><th>No.</th><th>Symptom</th><th>Part or Location</th><th>Method</th><th>Remedy</th></tr>
<tr><td rowspan="6">1</td><td rowspan="6">The LED lamp does not light when the power switch is turned ON.</td><td>(1) Instrument interior</td><td>Visually check for broken wire leads, missing parts, and disconnected connectors.</td><td>Repair as necessary.</td></tr>
<tr><td>(2) Power cord</td><td>Make a continuity test.</td><td>Replace.</td></tr>
<tr><td>(3) Power circuit fuse (F1)</td><td>Replace, if blown, after removing the cause of the problem.</td><td>Replace.</td></tr>
<tr><td>(4) Noise filter (NF1)</td><td>Check.</td><td>Replace.</td></tr>
<tr><td>(5) Power switch (S1)</td><td>Check.</td><td>Replace.</td></tr>
<tr><td>(6) Power supply section (PU1)</td><td>With a digital voltmeter, check that the following voltages are reaching terminals 1 through 5 of P6.
<table><tr><th>P6 terminal No.</th><th>Voltage</th></tr><tr><td>Terminals 1-2</td><td>+ 5 V</td></tr><tr><td>Terminals 4-3</td><td>-15 V</td></tr><tr><td>Terminals 4-5</td><td>+15 V</td></tr></table></td><td>Replace.</td></tr>
<tr><td>2</td><td>The MEASUREMENT mode is not entered 5 seconds after the power switch turn-on. (The GATE lamp does not light.)</td><td>(1) CPU circuit (P2)</td><td>a) Check the RESET signal from the CPU (IC1).
Check that the voltage from pin 26 of IC1 changes from 0 to +5 V when the power switch is turned ON.
o If there is a malfunction, check the 1/2 circuit of IC5.</td><td>Replace the defective part.</td></tr>
</table>

No.	Symptom	Part or Location	Method	Remedy
			b) Check the CLOCK signal from CPU (IC1). Check that the waveform from pin 6 of IC1 is as shown below.  o If the above waveform does not appear, check the IC6 oscillation circuit and IC4.	Replace or repair defective parts.
			c) Check the NM1 signal from CPU (P1). Check that the waveform from pin 17 of IC1 is as shown below.  o If the above waveform does not appear, check the IC6 oscillation circuit and IC5.	Repalce or repair defective parts.
		(2) PC boards (P1, P2, P3, and P5)	Have on hand the AQ-1135E (main unit) which normally functions. Replace PC boards (P1, P2, P3, and P5) with new ones to identify defective boards. o Repair the defective boards referring to the procedure for adjustments.	Replace or repair defective parts.

<table>
<tr><th>No.</th><th>Symptom</th><th>Part or Location</th><th>Method</th><th>Remedy</th></tr>
<tr><td></td><td></td><td></td><td>NOTES:
1. Before replacing the PC boards, turn OFF the power switch and disconnect the AC power cord from the main unit.
Caution:
If the above instruction is not followed, the circuits can be damaged because the AC power line comes into contact with the PC boards.
2. Do not confuse the PC board position when inserting the boards (P1, P2, P3, and P5) into the AQ-1135E main unit.
Caution:
If the PC board is inserted in wrong position, it can be damaged because an abnormally high voltage may be applied to it.</td><td></td></tr>
<tr><td>3</td><td>The offset adjustment is not made with the CW light sensor although the AUTO OFFSET switch has been pressed. (The AUTO OFFSET lamp remains lit.)</td><td>(1)
Input amplifier circuit (P1)</td><td>a) Connect the dummy sensor to the sensor INPUT terminal. Set the sensor switch to [6] and the resistor selector switch to [5 kΩ]. Make the offset adjustments by pressing the AUTO OFFSET switch and then, with a digital voltmeter, check the voltages from the following IC terminals.
<table><tr><th>IC terminal No.</th><th>Voltage</th></tr><tr><td>Pin 3 of P1 IC2</td><td>0 V</td></tr><tr><td>Pin 6 of P1 IC2</td><td>0 V</td></tr><tr><td>Pin 6 of P1 IC3</td><td>0 V</td></tr><tr><td>Pin 6 of P1 IC6</td><td>0 V</td></tr><tr><td>Pin 6 of P1 IC8</td><td>0 V</td></tr><tr><td>Pin 1 of P1 IC9</td><td>0 V</td></tr><tr><td>Pin 15 of P1 IC10</td><td>0 V</td></tr><tr><td>Pin 6 of P1 IC11</td><td>0 V</td></tr><tr><td>Pin 1 of P1 IC18</td><td>0 V</td></tr></table></td><td>Replace defective parts, if any.</td></tr>
</table>

No.	Symptom	Part or Location	Method	Remedy
			NOTE: When the AUTO OFFSET switch is activated normally, the DC output from the analog OUT (J2) plug should be 0 V.	
		(2) A/D converter circuit (P1)	a) Check P1 IC13 and IC14.	Replace defective parts, if any.
		(3) PC boards (P1, P2, P3, and P5)	a) Perform checkout referring to the Troubleshooting Guide, Sec. 1-(6), and repair parts as necessary.	Replace or repair defective parts, if any.
4	The optical power level reading is largely incorrect.	(1) Optical head	a) Check that the optical sensor light receiving face is free of cracking, scratches, or other defects.	Replace.
			b) Check the optical sensor light receiving face for soiling. o Clean the face, if soiled, with a cotton moistened with absolute alcohol or other suitable cloth material.	Clean the sensor light receiving face.
			c) Visually check the head interior for broken wire leads and missing parts.	Repair as necessary.
			d) Check the sensitivity adjustment control (RV1) for poor contact or other undesirable conditions.	Replace.
			e) Make a continuity test of the sensor cord.	Replace the sensor cord, if defective.

No.	Symptom	Part or Location	Method	Remedy
		(2) Main unit (AQ-1135E)	a) Check the main unit referring to the Testing Procedure for Adjustments (AQ-1135E), Sec 19 and 20 under DC Calibration Test and Sec. 21 under AC Calibration Test. o If there is any abnormality, check P1 relays (RL1 through RL11), relay drives (IC5 and IC12), IC7, IC1, TR1, IC2 through IC4, IC6 through IC10, IC12, and IC13.	Replace defective parts, if any.
		(3) PC boards (P1, P2, P3, and P5)	a) Check the PC boards and repair, if necessary, referring to the Trouble-shooting Guide, Sec. 1-(6).	Replace or repair defective parts.
5	The level measurement cannot be made when the high-sensitivity sensor (AQ-1965 or AQ-1966) is used.	(1) P3 of AQ-1135E (main unit)	a) Check that the waveform of the output from terminal 10 of P3 IC16 is as shown below when the high-sensitivity sensor is connected.  Frequency = 540 Hz o When the above waveform does not appear, check the IC17 oscillation circuit and IC16.	Replace defective parts.

No.	Symptom	Part or Location	Method	Remedy
		(2) High-sensitivity sensor (AQ-1965 or AQ-1966)	Check that the motor (M01) for the 270-Hz chopped light is turning. (Bring your ear close to the sensor head and check for humming.) o When the motor does not turn, check for a broken sensor cord and also check the motor drive circuit (P1) and motor (M01).	Repace or repair defective parts.

TROUBLESHOOTING CHART

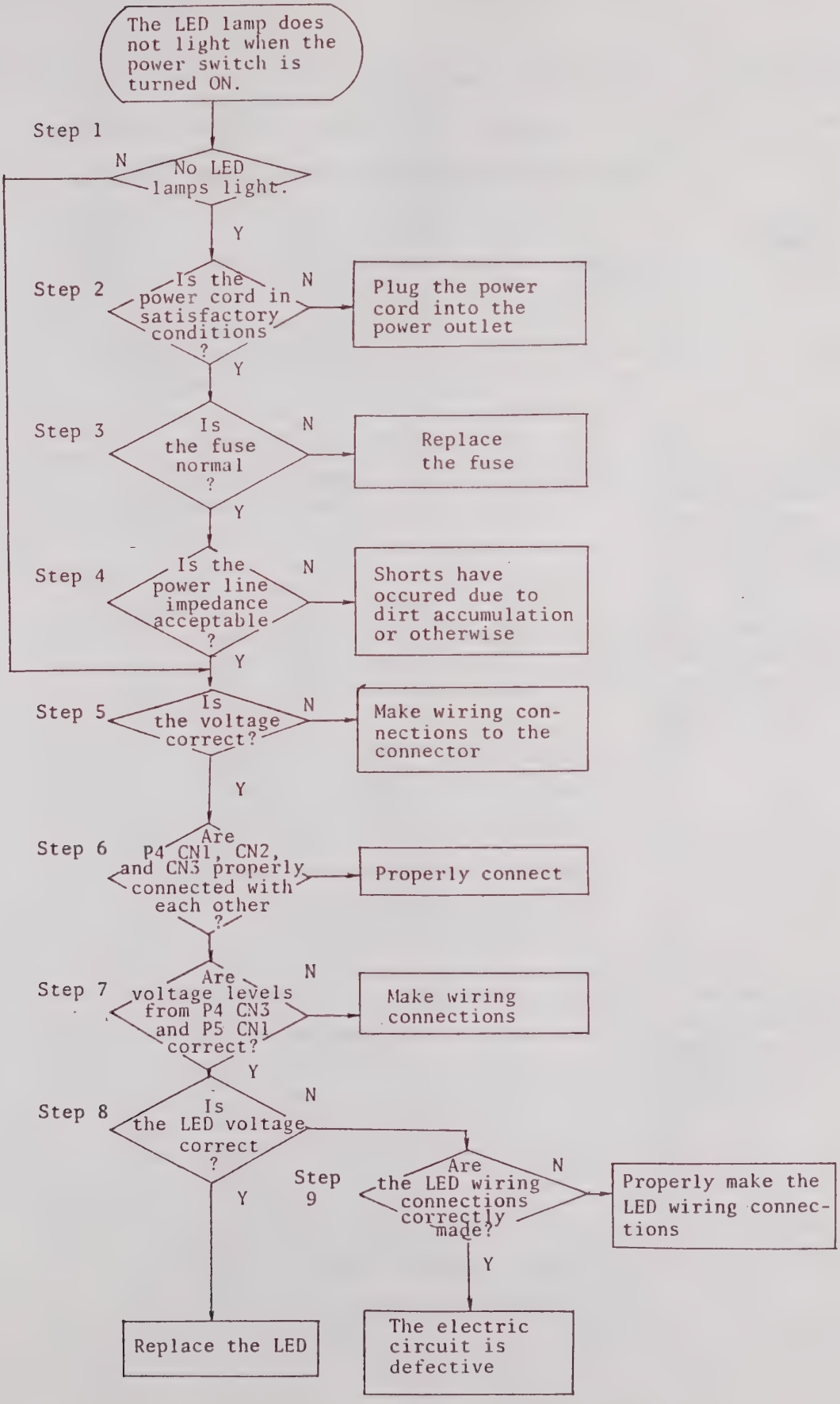
FOR

AQ-1135E OPTICAL POWER METER

ANDO ELECTRIC CO., LTD.

Tokyo, Japan

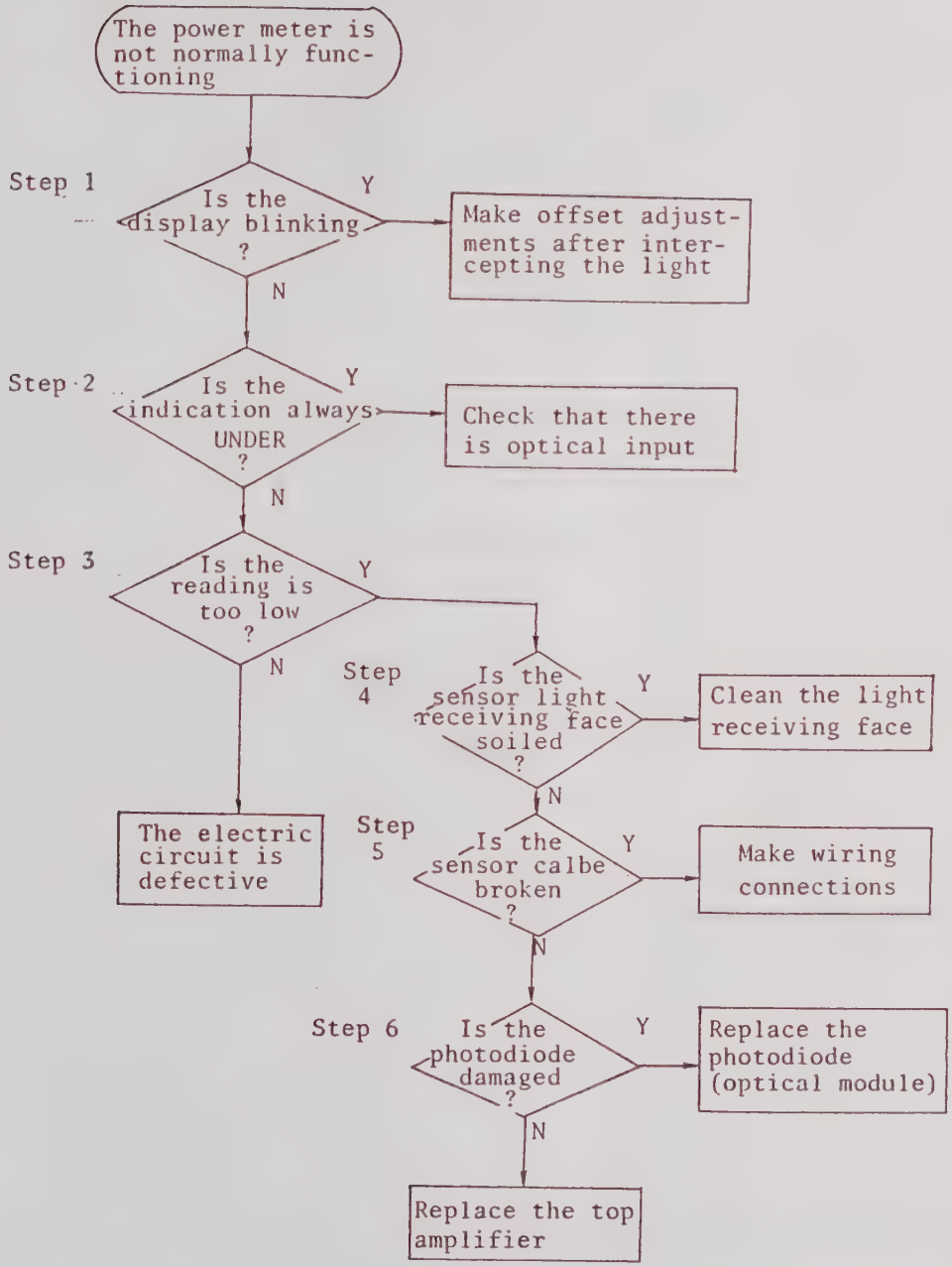
TROUBLESHOOTING CHART FOR AQ-1135E OPTICAL POWER METER



All the LED lamps should light when the AQ-1135E Optical Power Meter is turned on. If any one of the LED mapls does not light, perform checkout according to the procedure set forth below.

Step	Method	Remarks
1	When more than one LED lamp light, perform checkout from step 5.	
2	Is the power cord properly connected to the power outlet?	
3	Is the 0.5 A fuse in the fuse box blown? If blown, replace it.	Turn OFF the power switch before checking the fuse. Fuse: MF51NN 250 V, 0.5A, AC05 type
4	Disconnect the plug (PL4) from PU1 CN2 and check for impedances between the following terminals. PL4•3 ——— PL4•2 (+5 V line) PL4•6 ——— PL4•5 (+15 V line) PL4•4 ——— PL4•5 (-15 V line) When each impedance is zero between the above-mentioned terminals, each power line is shorted to the ground wire.	Turn OFF the power switch before performing checkout. Use a tester.
5	Securely connect the plug (PL4) to PU1 CN2. Check that the specified voltages appear between the following terminals. PL4•3 ——— PL4•2 + 5 V PL4•6 ——— PL4•5 +15 V PL4•4 ——— PL4•5 -15 V When the specified voltages do not appear between the above terminals, check that the AC voltage appear between terminals 1 and 3 of PU1 CN1.	Turn OFF the power switch before performing checkout. Use a tester.

Step	Method	Remarks
6	A connector is used to connect P4 CN1 and P5CN1 and between P4 CN2 and P5 CN2. A flat cable is used to connect P5 CN3 and P6 CN2. Check for poor connections.	
7	After ensuring that connections are under desirable conditions, check that +5 V is reaching P4 CN3-B25B and P5 CN1-A9. If +5 V is not reaching them, check wiring connections for condition. When +5 V is reaching P6 CN2-B25, check the connecting cord for continuity.	Use a tester.
8	Check the voltage appearing across the LED which does not light on power turn-on. When +5 V is reaching the LED in that condition, you should suspect a damaged LED. When no voltage appears, defective electric PC board may be defective.	Turn OFF the power switch before performing checkout. Use a tester.


The power meter is not normally functioning
Step 1
Is the display blinking ?
Y
Make offset adjustments after intercepting the light
N
Step 2
Is the indication always UNDER ?
Y
Check that there is optical input
N
Step 3
Is the reading is too low ?
Y
N
The electric circuit is defective
Step 4
Is the sensor light receiving face soiled ?
Y
Clean the light receiving face
N
Step 5
Is the sensor calbe broken ?
Y
Make wiring connections
N
Step 6
Is the photodiode damaged ?
Y
Replace the photodiode (optical module)
N
Replace the top amplifier

When the AQ-1135E Optical Power Meter is not normally functioning, perform checkout according to the procedure set forth below.

Step	Method	
1	Is the light intercepted from the sensor? If not, intercept the light and make offset adjustments again. If the indicator still blinks, you should suspect a damaged PI IC1. Replace.	
2	Is the light actually reaching the apparatus? Is the light source switch is in the ON position? When the light is reaching the apparatus, then P1 IC1 may be damaged. Replace.	
3	When the reading is too low relative to the optical input, perform checkout according to step 4 and below. When the problem is other than set forth in steps 1 through 3, the electric circuit may be defective.	
4	Is the light receiving face soiled? If soiled, clean the face with a wiping paper moistened with absolute alcohol.	Use a wiping paper moistened with absolute alcohol.
5	Is the sensor cable broken? If terminal 11 of the sensor plug (PL1) is broken, the reading will decrease by about 3 dB.	Use a tester.
6	When the optical power is correctly measured with a normal sensor, the photodiode (optical module) in the sensor under test may be defective. Replace. If abnormal conditions still persist, a damaged P1 IC1 is to blame. Replace.	Use a normal sensor.

ABSOLUTE VALUE CALIBRATION OF AQ-1135E OPTICAL POWER METER

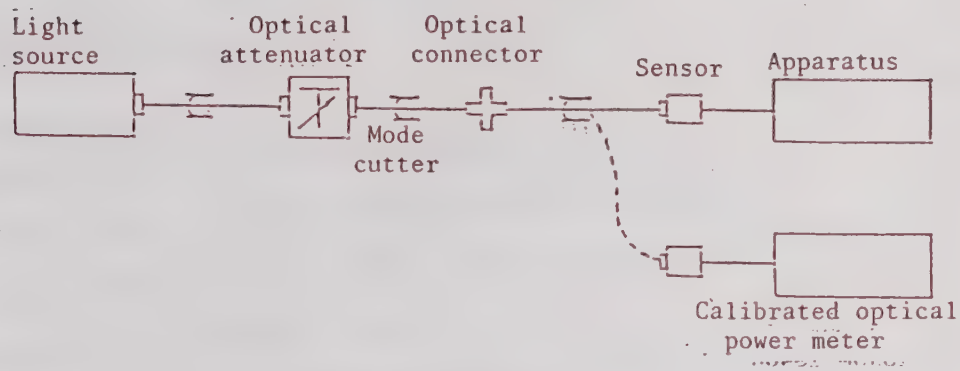


Fig. 1 Measurement System

(1) Adjust the optical attenuator until the calibrated optical power meter reading reaches -23 dBm in the measurement system shown above.

(2) Connect the apparatus to the sensor. Gain access to VR1 through the adjusting hole and adjust it until the apparatus reading reaches -23 dBm. Be sure to make adjustments at the reference wavelength. See Fig. 2.

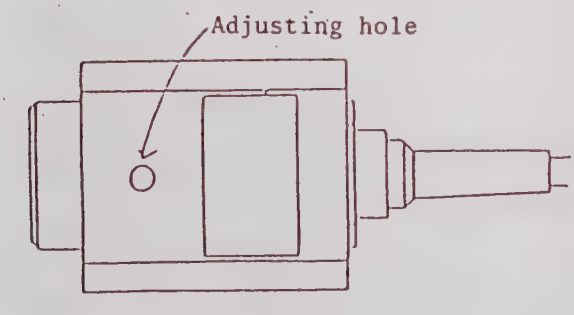


Fig. 1 Sensor

AQ-1135E OPTICAL POWER METER

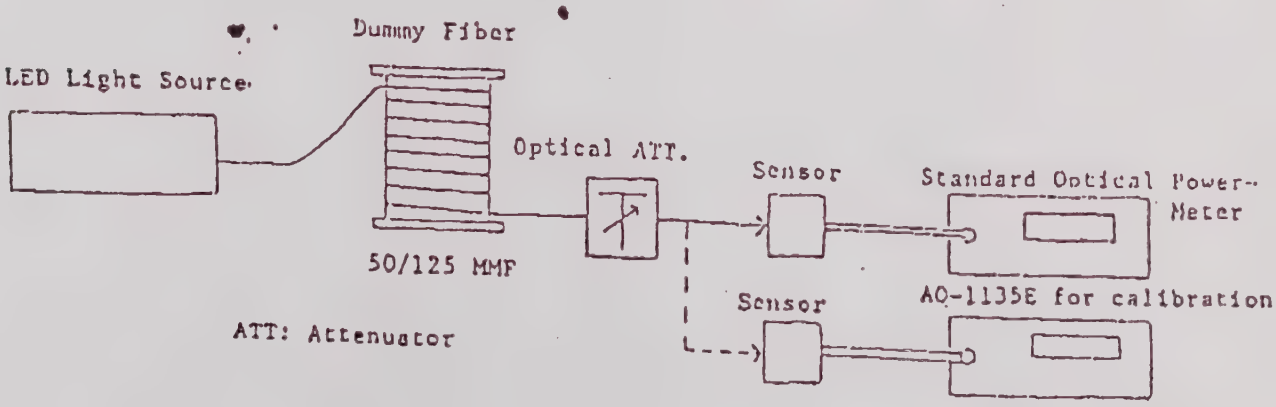
CALIBRATION PROCEDURE

1. Equipment to be Employed

		Q'TY
(1)	Standard Optical Power Meter (AQ-1111 or AQ-1135E)	1
(2)	AQ-1905 sensor (longwave length sensor for the AQ-1111) or AQ-1973 sensor (longwave length sensor for the AQ-1135E)...for longwave length sensor calibration.	1
(3)	AQ-1906 sensor (shortwave length sensor for the AQ-1111) or AQ-1974 sensor (shortwave length for the AQ-1135E)...for shortwave length sensor calibration.	1
(4)	AQ-1317 LED Light Source (longwave length 1300nm)...for longwave length sensor calibration	1
(5)	AQ-1304 LED Light Source (shortwave length 850nm)...for shortwave length sensor calibration	1
(6)	Dummy fiber GI 50/125 with plugs at both ends (about 1km)	1
(7)	Optical Attenuator	1
(8)	AQ-1918[ ] and AQ-1954[ ] type connector adaptor	2

2. Optical Power Calibration

Connect dummy fiber with standard power meter like this picture.



(1) Turn on the standard power meter and LED Light Source.

(2) Mount off two screws of fixing the sensor case, and open the sensor head by taking off the cases.

(3) Leave the power meter 15 min. to stabilize.

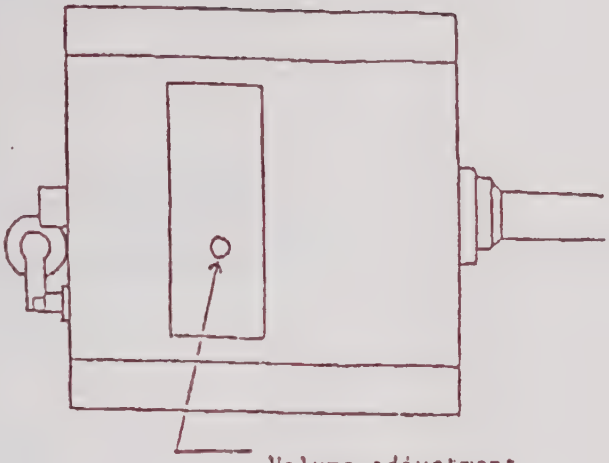
(4) Connect the dummy fiber to the standard power meter through optical attenuator set the optical attenuater to indicate the power level as -33.00dBm for the optical power meter.

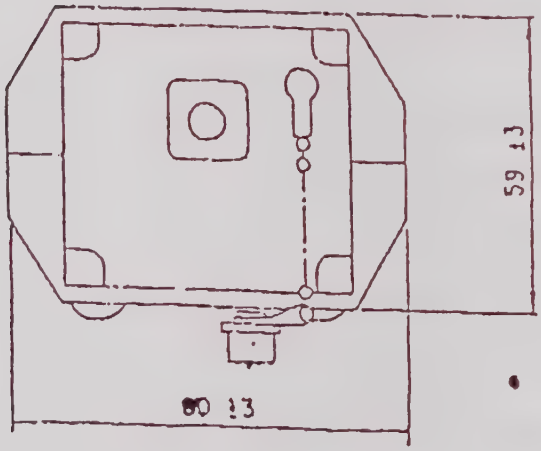
(5) Connect the same fiber to the sensor of AQ-1135E, adjust the internal volume of the sensor of AQ-1135E to indicate the optical power level by AQ-1135E as -33.00dBm.

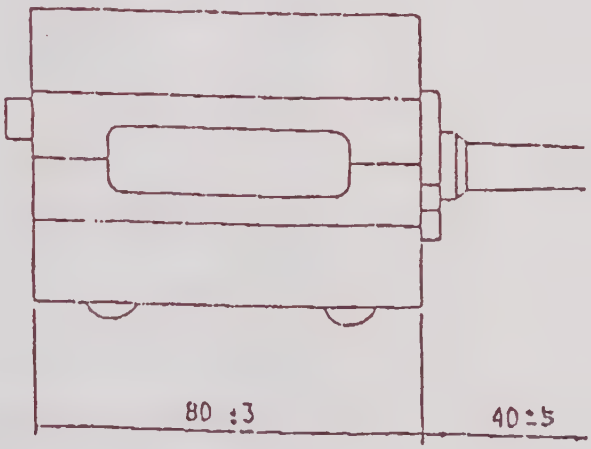
AQ-1965, AQ-1966 SENSOR

NOTE:

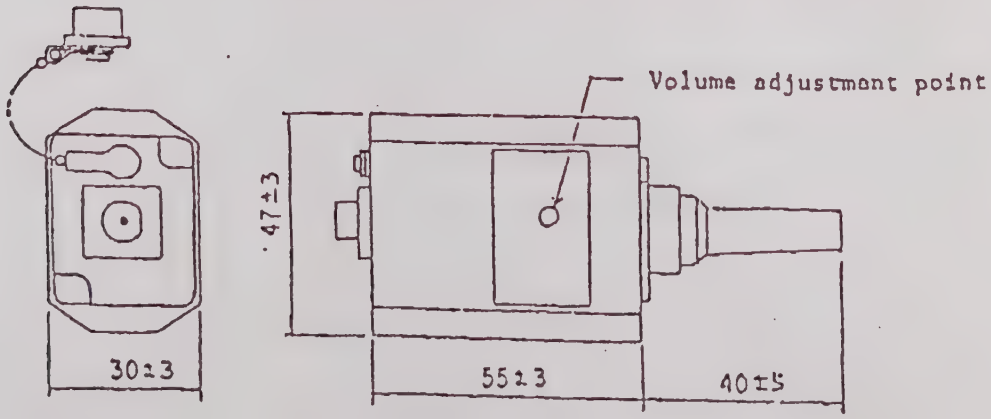
* Employ AQ-1304 for the shortwave length.
  Employ AQ-1317 for the longwave length.
* Use the sensor in response to the longwave length.
* Set CHOP(270Hz) on LED light source when CHOP sensor is used.
  (Unable to employ AQ-1111)
* Set CW on LED light source when CW sensor is used.
* AQ-1976 sensor is for space propagation, calibrate it by using the equipment to be employed and optical fiber.







AQ-1971, AQ-1972, AQ-1973, AQ-1977, AQ-1983 SENSOR



TESTING PROCEDURE FOR ADJUSTMENT

Type AQ-1135 Optical Power Meter (General)

Main Instruments Use
1. AE-8201A desktop computer (amics 816)
2. AQ-1924(E) GP-IB card dummy sensor
3. AQ-1111 optical power meter (standard)
4. AQ-1317 LED light source
5. AQ-1304 LED light source
6. LD light source (utility model No. 10118)
7. Optical ATT
8. Monochrometer
9. ROM writer

NOTE: Use the items listed above or the equivalent.

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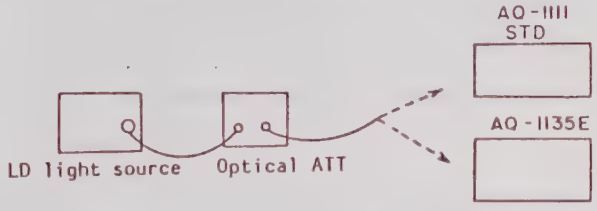
No.	Item	Testing Method	Remarks
1	GP-IB ACTUATION CHECK	1) Use the AE-8201 desktop computer (amics 816) or the 9845B personal computer. 2) Use the following programs for testing purposes. a. amics 816: 1135-GP b. hp 9845B : 1135-1	ó Use the dummy sensor.
2	WAVELENGTH-SENSITIVITY CHARACTERISTIC	1) Obtain the wavelength-sensitivity characteristic measuring set on hand. The necessary programs are as follows. a. "1135-A" b. "1976-1": 50-nm steps "1976-2": 10-nm steps (Use the "1135-A" program for sensors other than the AQ-1976.) 2) Measurement Method a. Sensors Other Than AQ-1976 ① Collect the data in 50-nm steps. ② Measure correction values when the deviated data is not within the specified limits. ③ Change the contents stored in ROM (the main unit, P2 IC17) by use of the data correction value obtained in step ②. The addresses for each sensor wavelength correction table are as follows.	ó Use the 3/26 master ROM.

<Sensor name>	<Address> <Beginning>	<End>
AQ-1965	0AA1	0B1A
AQ-1966	05C9	0642
AQ-1971	0C37	0CB0
AQ-1972	0A1D	0A96
AQ-1973	0875	08EE
AQ-1974	07E9	0862
AQ-1977	0875	08EE
AQ-1978	05C9	0642
AQ-1983	0AA1	0B1A

No.	Item	Testing Method	Remarks
		④ Start writing, beginning with the low-order data. [Reference] When the correction value of the AQ-1965 is 015B: Address 0AA1 ← 5B Address 0AA2 ← 01 ⑤ Change the contents in ROM as suggested above, and measure the wavelength-sensitivity characteristics again in 10-nm steps to check that the deviated data is within the specified limits. b. AQ-1976 Sensor ① Collect the data in 50-nm steps ("1976-1"). ② When the data is not within the specified limits, connect the adapter between the main unit P6 CN1 and PL7. Set the selector switch to [AQ-1974]. ③ Measure the correction value ("1976-K"). ④ Change the contents stored in ROM referring to the correction value obtained in step ③ (P2 IC17). [NOTE] a. There is no correction table at 633 nm. b. Do not change the contents between 630 nm and 640 nm (the master should be kept unchanged). ⑤ Measure the wavelength-sensitivity characteristic again in 10-nm steps after disconnecting the adapter ("1976-2"). [NOTE] The measurement outside the range from 400 to 440 nm serves no purpose.	o The range expands when the adapter is set to [AQ-1974].

No.	Item	Testing Method	Remarks
		⑥ In 50 nm steps, re-collect the same data as was collected in step ⑤. (In this step, do not collect the data at 400 nm.)	
3	STEP AND LINEARITY CHECK	1) Arrangement of Measuring Instruments  2) Step Error Measurement ① Measure the steps of the AQ-1111 standard long and short wavelength sensors. Record the data collected. ② At the beginning, set the ATT STEP to 20 dB. Adjust CONT until the STD value reaches -23 dBm. ③ Make measurements in 0 to 30 dB steps for long wavelengths and in 0 to 50 dB steps for short wavelengths. Record the measurements as the data for each step. ④ Collect the data in a like manner by use of the AQ-1135E. (In cases where attenuation is insufficient, use 2 attenuators.) ⑤ The step error is the difference between the step data obtained from the AQ-1111 standard and that from the AQ-1135E. A difference of less than 2 dB is acceptable. 3) Linearity Measurement ① Adjust the AQ-1111 standard until -23.00 dBm appears on the indicator. Feed the optical output from the standard into the sensor of the AQ-1135E.	

No.	Item	Testing Method	Remarks
		Then adjust the sensor control until -23.00 dBm appears on the AQ-1135E display. ② After the step ① , adjust the standard to obtain the indication -1.00 dBm. Inject the output from the standard into the AQ-1135E sensor and obtain the indication. A difference of less than 0.2 dB between the two indications is acceptable.	
4	ABSOLUTE LEVEL VALUE CALIBRATION	1) Arrange the instruments as shown in Item 3. Use LED (AQ-1304 or AQ-1317) as a light source. 2) Absolute Value Calibration ① Perform the absolute value calibration in the same manner as with the other power meters [see Item 3-3)- ①]. [NOTE] Although the AQ-1976 sensor has a calibration point at 633 nm, perform calibration at the short wavelengths, with the [CAL FACTOR] switch set at 850 nm. ② The calibration value is -23.00 dBm (for all the sensors).	

TESTING PROCEDURE FOR ADJUSTMENT

Type AQ-1135E Optical Power Meter

Main Instruments Use		
1. Digital multimeter	VP-2650A	National
2. Universal counter	TR-5104G	Takeda
3. Microcomputer analyzer	AE-4103C	Ando
4. DCV standard	2552	YEW
5. Oscillator	AD-4730	Ando
6. Level meter	AD-4730	Ando
7. ATT	AL-205	Ando

NOTE: Use the items listed above or the equivalent.

ANDO ELECTRIC CO., LTD.

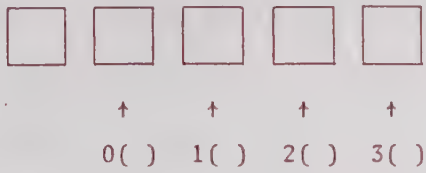
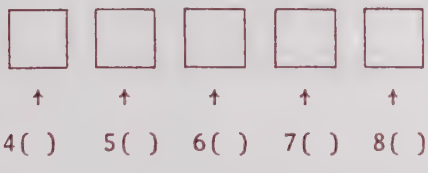
Tokyo, Japan

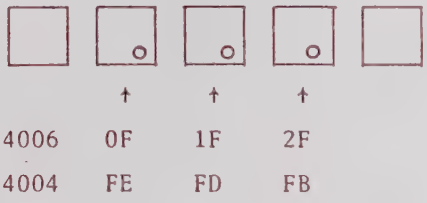
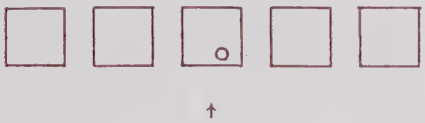
<table>
<tr><th>No.</th><th>Item</th><th>Testing Method</th><th>Remarks</th></tr>
<tr><td>1</td><td>INSULATION RESISTANCE</td><td>Measure the insulation resistance between the power plug and the casing with a 250-Volt DC megger.</td><td></td></tr>
<tr><td>2</td><td>LINE VOLTAGE</td><td>(1) Set S1 through S4 of P3 (PRE-406453) to [5] and S5 to [0].
(2) Set the [AC/DC] switch to [AC].
(3) Measure the impedance at the following check points with a tester and check for DC voltage.
<table><tr><th>Check point</th><th>Voltage</th></tr><tr><td>P6(PRE-904792) Terminal 2</td><td>+ 5V</td></tr><tr><td>P6(PRE-904792) Terminal 5</td><td>+15V</td></tr><tr><td>P6(PRE-904792) Terminal 3</td><td>-15V</td></tr><tr><td>P6(PRE-904792) Terminals 1 and 4</td><td>GND</td></tr><tr><td>P1(PRE-904791) IC18 5 , 7</td><td>+10V</td></tr></table></td><td></td></tr>
<tr><td>3</td><td>OPERATING PROCEDURE</td><td>(1) Connect IC13 (32) (at the left-hand end of R74) to GND.
(2) Check that the indications are as follows when the [POWER] switch is set to [ON].
All lamps light.
+ 18.8.8.8
8 8.8 8
↓
The [dBm], [AUTO], and [AUTO OFFSET] switch lamps light.
- 0 0.0 0 dBm
0 0 0 0 nm
↓
The [dBm] and [AUTO] switch lamps light.
- 4 2.0 0 dBm
1 3 0 0 nm
The [GATE] switch lamp flashes on and off and the [UNDER] switch lamp lights.</td><td></td></tr>
</table>

No.	Item	Testing Method	Remarks
4	MOTOR DRIVE PULSE	(1) Connect a dummy sensor (No. 10088) to [INPUT] and set the [SENSOR] switch to [F]. (2) On an oscilloscope, check that the frequency of the pulse derived from IC16 ⑫ of P3 (PRE-406453) slowly increases after power turn-on. (The frequency reaches a given level after several seconds.) (3) The frequency should ultimately reach 540 to 560 Hz. If it is outside that range, adjust R25 of P3. (4) Adjust CV1 and C16 until the pulse frequency derived from IC17 of P5 reaches 138.24 kHz. The frequency derived from IC17 ④ should be 540.0 Hz. (5) Check that the frequency is changed to 540 Hz, as referred to in step (4), when the frequency of the voltage from the dummy sensor's [540 Hz] output has reached the level referred to in step (3) after power turn-on. (6) The 540-Hz pulse should be delivered when the [SENSOR] switch is set at [A], [B], [D], [E], and [F], and should not be delivered when this switch is set at [2], [3], [5], [6], and [7].	
5	CLOCK PULSE	Check that the frequency derived from IC6 ②of P2 (PRE-406452) is 3.2768 MHz and that from IC③is 205 kHz.	
6	MEMORY CHECK	(1) Connect the microcomputer analyzer to P2. (2) Check on System ① The system program area is indicated by addresses 0000 through 1FFF.	

<table>
<tr><th>No.</th><th>Item</th><th>Testing Method</th><th>Remarks</th></tr>
<tr><td></td><td></td><td>②Check the data read into the memory against that stored on the cassette tape.
Operation of microcomputer analyzer:
[3] → [OPT] → [3] → [RUN]
[3] → [OPT] → [2] → [RUN]
[1] → [RUN]
*
The analyzer acceptably tests when only zeros appear on its indicator. When the analyzer does not acceptably test, "E" appears on the indicator.
(3) Check on Table
Perform the table checkout in the same manner as set forth in step (2) provided, however, that file No. 2 should be used.
(4) Check on RAM
Perform the write and read checkout at addresses 2000 through 27FF.</td><td>* Figures in brackets ([ ]) denote file numbers.</td></tr>
<tr><td>7</td><td>LAMP CHECK</td><td>(1) Check that lamps corresponding to the data listed below light when such data is written at the following memory addresses.
<table><tr><th>Address</th><th>Data</th><th>Lamp</th></tr><tr><td>4002</td><td>01</td><td>dBm</td></tr><tr><td></td><td>02</td><td>dB REF</td></tr><tr><td></td><td>04</td><td>mW</td></tr><tr><td></td><td>08</td><td>μW</td></tr><tr><td></td><td>10</td><td>nW</td></tr><tr><td></td><td>20</td><td>pW</td></tr><tr><td></td><td>40</td><td>nm (C.F.)</td></tr><tr><td></td><td>80</td><td>dB (C.F.)</td></tr><tr><td>4003</td><td>01</td><td>REMOTE</td></tr><tr><td></td><td>02</td><td>LISTEN</td></tr><tr><td></td><td>04</td><td>TALK</td></tr><tr><td></td><td>08</td><td>OVER</td></tr><tr><td></td><td>10</td><td>UNDER</td></tr><tr><td></td><td>20</td><td>GATE</td></tr><tr><td>4000</td><td>01</td><td>GCBO *</td></tr></table></td><td>* Dummy sensor lamp</td></tr>
</table>

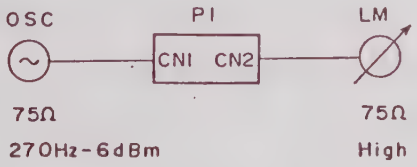
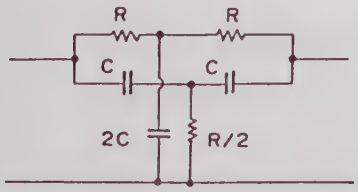
<table>
<tr><th>No.</th><th>Item</th><th>Testing Method</th><th>Remarks</th></tr>
<tr><td></td><td></td><td>(2) Check the following switch lamps in the same manner as set forth in step (1).
<table>
<tr><th>Address</th><th>Data</th><th>Lamp</th></tr>
<tr><td>4005</td><td>01</td><td>AUTO OFFSET</td></tr>
<tr><td></td><td>02</td><td>1/1000 dB</td></tr>
<tr><td></td><td>04</td><td>AVE</td></tr>
<tr><td></td><td>08</td><td>W</td></tr>
<tr><td></td><td>10</td><td>dBm</td></tr>
<tr><td></td><td>20</td><td>dB REF</td></tr>
<tr><td></td><td>40</td><td>AUTO/HOLD</td></tr>
<tr><td></td><td>80</td><td>SET</td></tr>
</table></td><td></td></tr>
<tr><td>8</td><td>PANEL SWITCH CHECK</td><td>(1) Set to [0] the [SENSOR] switch of the dummy sensor.
(2) Check that the data is changed as required while the contents at the following addresses are continually read with the repeated press of the switches.
<table>
<tr><th>Address</th><th>Switch</th><th>Data</th></tr>
<tr><td>4000</td><td>Non-push</td><td>FF</td></tr>
<tr><td></td><td>AUTO OFESET</td><td>FE</td></tr>
<tr><td></td><td>1/1000 dB</td><td>FD</td></tr>
<tr><td></td><td>AVE</td><td>FB</td></tr>
<tr><td></td><td>W</td><td>F7</td></tr>
<tr><td></td><td>dBm</td><td>EF</td></tr>
<tr><td></td><td>dB REF</td><td>DF</td></tr>
<tr><td></td><td>AUTO/HOLD</td><td>BF</td></tr>
<tr><td></td><td>RANGE</td><td>7F</td></tr>
<tr><td>4001</td><td>Non-push</td><td>FF</td></tr>
<tr><td></td><td>RANGE ▽</td><td>FE</td></tr>
<tr><td></td><td>SET</td><td>FD</td></tr>
<tr><td></td><td>C.F. ▷</td><td>FB</td></tr>
<tr><td></td><td>△</td><td>F7</td></tr>
<tr><td></td><td>▽</td><td>EF</td></tr>
<tr><td></td><td>dB/nm</td><td>DF</td></tr>
<tr><td></td><td>[SENSOR] [1]</td><td>BF</td></tr>
<tr><td></td><td>[SENSOR] [2]</td><td>7F</td></tr>
</table></td><td></td></tr>
<tr><td>9</td><td>INDICATION CHECK</td><td>(1) Write the data FF at addresses 4004 and 4006 in the memory.</td><td></td></tr>
</table>

No.	Item	Testing Method	Remarks
		(2) When the data is written at address 4006, figures should appear on the indicator which correspond to the data entered. The relationship between the indicator and the data is as follows. Measured Value Indicator  CAL FACTOR Indicator  (0) + (1) - * Parenthesized figures are indicated. [Example] When the data 35 is written, 5 appears as the least significant digit on the measured value indicator. (3) When the following data are written at address 4004, the following symbols appear at the position of the most significant digit. Date | Indication 18 | - F7 | + E8 | -1	

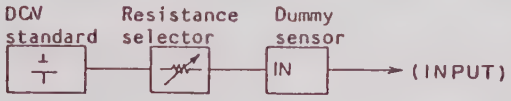
No.	Item	Testing Method	Remarks
		(4) When the data are written at addresses 4006 and 4004, the decimal points corresponding to such addresses should light.  (5) When 40 and 6F are written at addresses 4003 and 4006 respectively, the following decimal point should light on the CAL FACTOR indicator by writing 00 at address 4003. 	
10	CAL FACTOR SWITCH	(1) Repeatedly read the contents at the following addresses, change the positions of S1 through S5 of P5 (PRE-405747), and check that all of those settings and the data agree with each other. Address Data 4002 S1 4003 S3 S2 4004 S5 S4	o S5 ranges from [0] to [7].

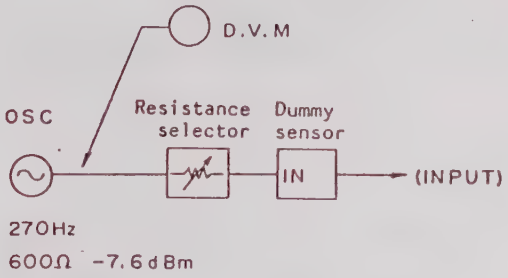
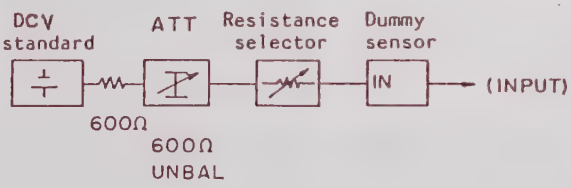
<table>
<tr><th>No.</th><th>Item</th><th>Testing Method</th><th>Remarks</th></tr>
<tr><td></td><td></td><td>[Example] When S2 and S3 are set to [2] and [3] respectively, after repeated read operations at address 4003, the analyzer data indicator displays:
[3] [2]
(2) After checkout, set S1 through S4, and S5, to [5] and [0] respectively.</td><td></td></tr>
<tr><td>11</td><td>AUTO OFFSET</td><td>(1) With a digital voltmeter, monitor the voltage from A33 (IC7-⑨) of P1 (PRE-904791).
(2) After writing the data at the following addresses, check that the following voltages are obtained by writing any desired data at address 6003.
<table><tr><th>6002</th><th>6001</th><th>6000</th><th>Voltage</th></tr><tr><td>0</td><td>0</td><td>0</td><td>-10.00 V</td></tr><tr><td>1</td><td>0</td><td>0</td><td>- 8.75</td></tr><tr><td>2</td><td>0</td><td>0</td><td>- 7.50</td></tr><tr><td>3</td><td>0</td><td>0</td><td>- 6.25</td></tr><tr><td>4</td><td>0</td><td>0</td><td>- 5.00</td></tr><tr><td>5</td><td>0</td><td>0</td><td>- 3.75</td></tr><tr><td>6</td><td>0</td><td>0</td><td>- 2.50</td></tr><tr><td>7</td><td>0</td><td>0</td><td>- 1.25</td></tr><tr><td>8</td><td>0</td><td>0</td><td>0</td></tr><tr><td>9</td><td>0</td><td>0</td><td>+ 1.25</td></tr><tr><td>A</td><td>0</td><td>0</td><td>+ 2.50</td></tr><tr><td>B</td><td>0</td><td>0</td><td>+ 3.75</td></tr><tr><td>C</td><td>0</td><td>0</td><td>+ 5.00</td></tr><tr><td>D</td><td>0</td><td>0</td><td>+ 6.25</td></tr><tr><td>E</td><td>0</td><td>0</td><td>+ 7.50</td></tr><tr><td>F</td><td>0</td><td>0</td><td>+ 8 75</td></tr><tr><td>F</td><td>F</td><td>F</td><td>+10.00</td></tr></table>[Note] Perform the write operation at address 6003 each time the data is changed.
(3) The voltage should change in -4.8 mV steps when 0 is changed, until it reaches F step by step at adress 6000, with 8 and 0 assigned to address 6002 and 6001 respectively.</td><td>o The voltage polarity can be reversed.</td></tr>
</table>

<table>
<tr><th>No.</th><th>Item</th><th>Testing Method</th><th>Remarks</th></tr>
<tr><td></td><td></td><td>(4) The voltage should change in -78 mV steps when 0 is changed, until it reaches F step by step with 0 assigned to address 6000.
(5) Monitor the voltage appearing at terminal 1 of P1 when the voltage is changed to +10 V by using step (2).
The voltage should vary with the data written at address 4000.
<table><tr><th>Data</th><th>Voltage</th></tr><tr><td>80</td><td>3.3 mV</td></tr><tr><td>00</td><td>0.32 V</td></tr></table></td><td></td></tr>
<tr><td>12</td><td>A/D
REF VOLTAGE</td><td>(1) Disconnect the microcomputer analyzer to restore normal conditions.
(2) Disconnect CN5 of P1.
(3) Connect the DCV standard to the CN5 terminal of P1 (PRE-904791). Set the output voltage to 0 V when turning on the power.
(4) Adjust RV6 until the voltage derived from IC13 (37) of P1 is +4.997 V.
(5) Check that the indicator displays 0.00 dBm (1.000 mW) when the DCV standard voltage is changed to +7.936 V. Also check that, when the voltage is reduced to 1/10, the indication is -10.00 dBm (0.100 μW).
(6) In the condition reached in step (5), the [ANALOG] voltage should be between +1.5 and +1.7 V (+1.614 V). When the input is reduced to 1/10, the output voltage should be also reduced to 1/10.</td><td></td></tr>
<tr><td>13</td><td>COMPARATOR</td><td>(1) Check the comparator for actuation under the conditions mentioned in Item 12.</td><td></td></tr>
</table>

No.	Item	Testing Method	Remarks
		(2) $\overline{DET}$ signal The signal from IC16 7 (left-hand end of R82) goes low when the input voltage (DCV standard voltage) exceeds +0.002 V and goes high when it is below +0.002 V. (3) OVER The OVER lamp should light when the input voltage exceeds +8.94 V. (4) UNDER The UNDER lamp should light when the input vlotage is below +0.64 V.	Indication, + 0.59 dBm Indication, - 90.92 dBm
14	270 Hz BPF (I)	(1) Connect CN5 of P1. (2) Disconnect CN1 and CN2 of P1 (PRE-904791). Connect the oscillator to the CN1 left-hand side (the R33 right-hand side) and the level meter to the CN2 right-hand side (the R41 left-hand side).  (3) Adjust R40, R41, and R43 of P1, until the frequency of the BPF pole (maximum level point) reaches 270 Hz ±0.5 Hz. [Reference] 1. Calculation formula  $f_o = \frac{1}{2 \pi C R}$	

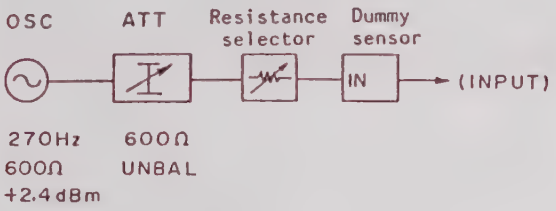
No.	Item	Testing Method	Remarks
		2. The pole lowers by about 0.5 Hz when the value is increased one step with the R40 and R41 settings in agreement. 3. The R43 reading is obtained from the R40 and R41 readings and should be near the value given by $R43 = \frac{R38 + R40}{2} - R42$ (4) Check that the bandwidth is about 15 Hz. (5) Check that losses at the following points are as follows. 370 Hz: approx. -23 dB 170 Hz: approx. -26 dB	R38 58.3KΩ R42 29.1KΩ
15	270 Hz BPF (II)	Make adjustments as is the case with No.14 under 270 Hz BPF (I) except for the following steps. (2) Input: At the CN3 right-hand side (the R61 left-hand side) Output: At the CN4 right-hand side (the R69 left-hand side) (3) Adjusting resistors: R68, R69, and R71. (4) Bandwidth: approx. 8 Hz (5) Losses: 370 Hz, approx. -28 dB 170 Hz, approx. -31 dB	
16	OFFSET VOLTAGE (I)	(1) Connect the dummy sensor. Set the [SENSOR] switch and the [R] switch to [6] and [5k] respectively. (2) Adjust RV1 until the OUT offset voltage reaches 0 V with IC2 IN of P1 connected to GND. (3) Make connection to GND and adjust RV until the offset voltage reaches 0 V.	RV1: hole A

No.	Item	Testing Method	Remarks
		[Note] o Accurately adjust the offset, since the linearity in a given range is adversely affected by inaccuracy in this adjustment. o In the AQ-1974 sensing operation, a -60 dBm measurement error occurring in the -50 dB range should be given particular attention.	
	Offset voltage (II)	(1) Check that the indication is below -50 dBm (because the adjustment is made when the gain of the P1 IC8 amplifier is at a maximum). (2) Connect IC8 IN to GND. Adjust RV2 until the offset voltage from OUT reaches 0 V. (3) Connect IC10 IN to GND. Adjust RV4 until the voltage from OUT reaches OV. (4) Connect IC11 3 to GND. Adjust RV7 until the offset voltage from IC11 6 reaches 0 V.	RV2: hole B RV4: hole D RV7: hole G
17	GAIN ADJSUTMENT (C W)	(1) Arrange the instruments as shown below.  (2) Set the [SENSOR] switch to [6]. Set the resistor selector to 10 MΩ. Set the DCV standard voltage to 0 V. Then proceed to the automatic operation. The [W] indication should be near +3.08 pW. (3) Adjust RV5 of P1 until the reading is -20.00 dBm (10.00 μW) with resistance and voltage set at 100 kΩ and -0.592 V respectively.	RV5: hole E

No.	Item	Testing Method	Remarks
18	GAIN ADJSUTMENT (CHOP)	(1) Arrange the isntruments as shown below.  (2) Set the [SENSOR] switch to [F]. Set the resistance to 1 MΩ. Set the oscillator output level to 0.3236 Vrms. Then adjust RV3 of P1 until the reading is -20.00 dBm.	Note: Accurately adjust the oscillator frequency to 270 Hz. RV3: hole C
19	DC CALIBRATION	(1) Arrange the instruments as shown below.  (2) Proceed to the automatic offset operation with the [SENSOR] switch set at [6], DCV standard at 0 V, ATT at MAX, and resistance controller at 10 MΩ. (3) Adjust the voltage from the DCV standard until the indication is -5.00 dBm, with the resistance set at 100 Ω and ATT at 0 dB. The [W] indicator should display +0.316 mW. (4) Triple the voltage obtained in step (3) so that the readings are as follows. +5.00 dBm +3.15 mW	[STANDARD] Accuracy, ±5% +0.21 dB -0.22 dB approx. -150 mV

No.	Item	Testing Method	Remarks
		(5) Adjust the voltage until the reading is -5.00 dBm with resistance set at 1 kΩ	approx. -0.49 V
		(6) Reduce the voltage by 1/10 so that readings are as follows. -15.00 dBm +31.6 μW	
		(7) Adjust the voltage until the readings are as indicated in step (6) with the resistance set at 10 kΩ.	approx. -0.39 V
		(8) Reduce the voltage by 1/10 so that readings are as follows. -25.00 dBm + 3.16 μW	
		(9) Adjust the voltage until the readings are as indicated in step (8), with the resistance set at 100 kΩ. The readings should be as follows when the voltage is reduced by 1/10. -35.00 dBm + 0.316 μW	approx. -0.38 V
		(10) Make adjustments as suggested above, with the resistance set at 1 MΩ until the redings are as follows. -45.00 dBm +31.6 nW	
		(11) Make adjustments ad suggested above, with the resistance set at 10 MΩ until the readings are as follows. -55.00 dBm + 3.16 nW	
		(12) Set ATT at 20 dB until the readings are as follows. -65.00 dBm +0.316 nW * Set the [AVE] switch to [ON] and check that the fluctuations in indication are minimized.	

No.	Item	Testing Method	Remarks
20	DC LINEARITY	(1) Arrange the instruments in the same manner as with Item 19. (2) Adjust the voltage until the reading is -20.00 dBm with the resistance set at 100 kΩ.	approx. -1.2 V
		(3) Set the [RANGE] switch to [HOLD]. Change the ATT position in 2 dB steps until 20 dB is reached. Check the linearity until -30 dBm is reached. (The reading changes in 1 dB steps.) (4) Change the function switch position to [dB REF] when the reading obtained in step (2) is -20 dBm. The reading should be 0.00 dB REF. Then change the level with ATT and check that the reading indicates the variations in level. [Example] o Reference measured value in dBm . . . . . -20.00 dBm o dB REF at ON . . . . . 0.00 dB REF o Level changed to -21 dBm afterwards . . . . . -1.00 dB REF (5) Set the [1/1000 dB] switch to [ON] after setting the function switch to [dB REF] in step (4). The reading should be 0.000 dB REF. Check the reading by changing the level. When the reading exceeds ±9.999, the [1/1000 dB] switch should be set to [OFF] and the reading should be given in 1/100 dB. (6) Adjust the voltage until the reading reaches +5 dBm with the resistance and ATT set at 100 Ω and 10 dB in 1 dB increments, respectively.	approx. -4.8 V
		(7) Decrease the attenuation setting in 2 dB steps and check the linearity until +10 dBm is reached.	

No.	Item	Testing Method	Remarks
21	AC CALIBRATION	(1) Arrange the instruments as shown below.  (2) Set the [SENSOR] switch to [E]. Set the resistance to 100 kΩ . Set ATT to 0 dB. (3) Adjust the oscillator output until the reading is -5 dBm or -45 dBm. When the reading is -45 dBm, actuate [HOLD][Δ] switch to change the range upward until the reading is -5 dBm. Then adjust the output in the [AUTO] mode. (4) Increase the attenuation setting in 20 dB steps and measure the step error occurring until -35 dBm is reached. When the reading is below -45 dBm, return the attenuation setting back to 0 dB. Actuate the [HOLD][∇] switch to change the range downward and obtain a reading of -45 dBm. Then make measurements in the [AUTO] mode until -85 dBm is reached. (5) Adjust the input level to obtain a reading of -5 dBm with the resistance and attenuation set at 10 kΩ and 20 dB respectively. Then decrease the attenuation level in 20 dB steps (0 dB) until +5 dBm is reached. (6) Set the [SENSOR] switch to [B] and make the adjustments or measurements according to steps (2) through (4).	

No.	Item	Testing Method	Remarks
		Perform checkout over the -5 dBm to -25 dBm, and -35 dBm to -75 dBm ranges. (7) Set the [SENSOR] switch to [A] and make adjustments or measurements according to step (5).	
22	SENSOR CHECK	(1) Change the position of the dummy sensor [SENSOR] switch to check as follows, the initial wavelength value and measurement range, which are selected with the [CAL FACTOR] switch. (2) The relationship between the [SENSOR] switch and the sensor is as shown below.	

SW	Sensor	Measurement range	Initial Wavelength
0	AQ-		nm
1			
2	1973	+ 5 to -50	1300
3	1971	+ 5 to -40	1300
4			
5	1976	+10 to -50	633
6	1974	+10 to -70	850
7	1972	+10 to -60	850
8			
9			
A	1977	+ 5 to -70	1300
B	1965	0 to -80	1300
C			
D	1980	0 to -90	850
E	1978	+10 to -90	850
F	1966	0 to -90	850

Check the measurement range as follows.

[Example] The switch is set at [F].

① CAL FACTOR reading, 850 nm.

② Since the input is zero, check the changes in reading by changing the range upward with the [Δ] switch after obtaining a reading of -92.00 dBm and setting the range switch to [HOLD]. The reading changes from -92 ⟶ -82 ..... -12 (-12 is the lowest value in the 0 dB range). The check on the measurement range is now complete.

No.	Item	Testing Method	Remarks
		③ When performing the checkout according to step ② , set the dummy sensor [VOLT] switch to [BIAS] and monitor the [DVM] voltage. The voltage should be biased when the -10 dB range is exceeded. The bias voltage ranges from 90 to 100 mV (the mid-point value is 95.8 mV). * In the AQ-1065 sensing operation, bias is applied at all times.	
23	CAL FACTOR SETTING	(1) With the [dB/nm] switch, the value setting alternates between nm and dB. Choose [dB]. (2) Pressing the [SET] switch caused the symbols indicating the lamp lighting and indication conditions to flash on and off. (3) Symbols changes between "+" and "-" when either the [Δ] or [∇] switch is pressed. (4) The place in which either symbol flashes on and off shifts to the right when the [▷] switch is pressed. (5) The indication should increase or decrease between 0 and 9 with the [Δ] and [∇] switches. The indicated value should be the sum of the measured value and the setting. [Example] When the calibration value (setting) is 00.00 dB, -92.00 dBm appears as the measured value. If the calibration value is set to +10.00 dB, the measured value will be -82.00 dBm. (6) Perform the same checkout by shifting the decimal point place by place.	

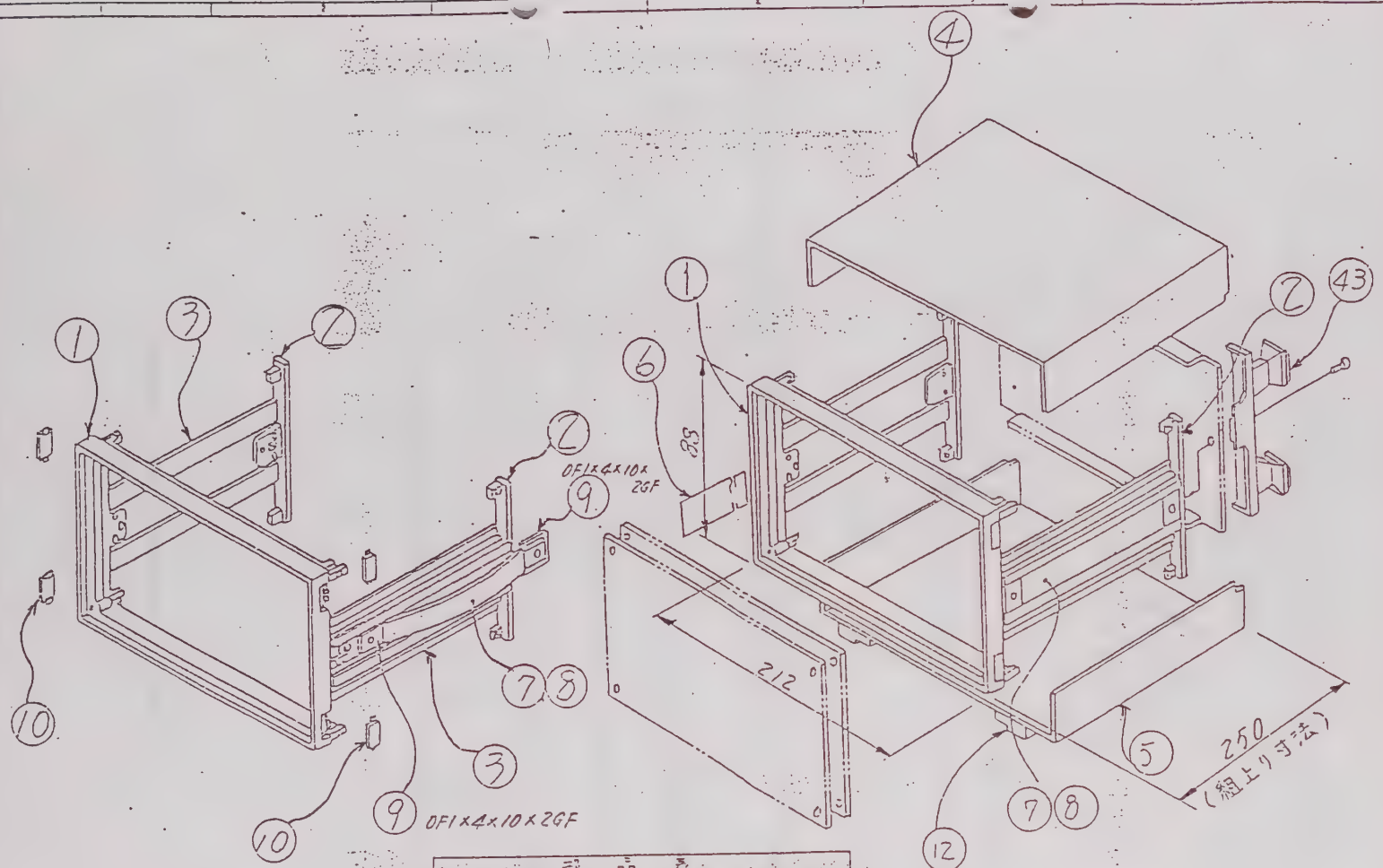
No.	Item	Testing Method	Remarks
		(7) Pressing the [SET] switch causes the lamp to go off and the setting operation is now complete. The indication stops flashing on and off. (8) Check that the wavelength can be selected in nm by pressing each switch. (9) The instrument should not respond to the actuation of the [SET] switch, when the value has been set outside the 400 to 1,000 nm short wavelength range, or the 1,000 to 1,600 nm long wavelength range. In this condition, the digit which normally flashes on and off should light and other digits sould flash on and off. (10) Test the CAL FACTOR switches (S1 through S4 of PS) on the rear panel in the same manner as described above. ① When [1](S4:6) is selected, the value setting should be made over the range from 1,000 through 1,600 nm with the other switches (S1 through S3). The indication should denote the setting. When the value has been set outside the specified wavelength range, all the digits flash on and off. ② The relationship between the switches and the setting ranges is as follows.	

	S4	Setting range
[1]	6	1000 to 1600 nm
[0]	7	000 to 999
[+]	8	+00.00 to +9.99 dB
[-]	9	-00.00 to -9.99
[+1]	0	+10.00 to +19.99
[-1]	1	-10.00 to -19.99

Test the switches, referring to the table given above.

<table>
<tr><th>No.</th><th>Item</th><th>Testing Method</th><th>Remarks</th></tr>
<tr><td></td><td></td><td>③ In setting the values in dB, check the measured value in the same manner as with step (5).
④ When setting the values as referred to above (with exception of the [OFF] switch), the front panel switches should not be actuated.</td><td></td></tr>
<tr><td>24</td><td>SENSOR POWER SUPPLY</td><td>(1) Measure the voltage from the dummy sensor [DVM].
(2) Check that the specified voltage is obtained by changing the [VOLT] switch position (+5V, ±15V).</td><td></td></tr>
<tr><td>25</td><td>EXTERNAL POWER SUPPLY</td><td>(1) Set the [AC/DC] switch to [DC]. With a tester, check the connection between the [DC INPUT] terminal and P1.
(2) Connect the external power supply (Type AP-2606 battery) to the [DC INPUT] terminal and check it for actuation.
<table>
<tr><th>[DC INPUT]</th><th>P1</th><th></th></tr>
<tr><td>A</td><td>DG</td><td>DGND</td></tr>
<tr><td>B</td><td>+ 5V</td><td>+ 5V</td></tr>
<tr><td>C</td><td>+15V</td><td>+15</td></tr>
<tr><td>D</td><td>-15V</td><td>-15</td></tr>
<tr><td>E</td><td>AG</td><td>AGND</td></tr>
</table>
(2) Connect the external power supply (Type AP-2606 battery) to the [DC INPUT] terminal and check it for actuation.</td><td></td></tr>
</table>

041



版数	年月日	承認
1	59 6 7	
2	61. 8. 18 △2×1 K424 K084	

製造用原図

部品番号	個片番号	個片名	数量
1	P02-14001	前枠	1
2	P02-14031	後枠	2
3	P02-14055	基本ステー	2
4	P02-14072	上面板	1
5	B-61327-1-2	下面板	1
6	〃 4	ステー用化粧板	1
7	P02-51038	把手	1
8	P02-51057	芯金	1
9	P02-51096	把手ホルダー	2
10	P02-56043	アクセサリー(1)	4
11			
12	P02-54025	スタンドホルダー	4
13	P02-54026	支持足	4
14	B-61022-1-22	スタンド	1

△2 1. ⑥は OF1×4×12×2GFにて取付け.

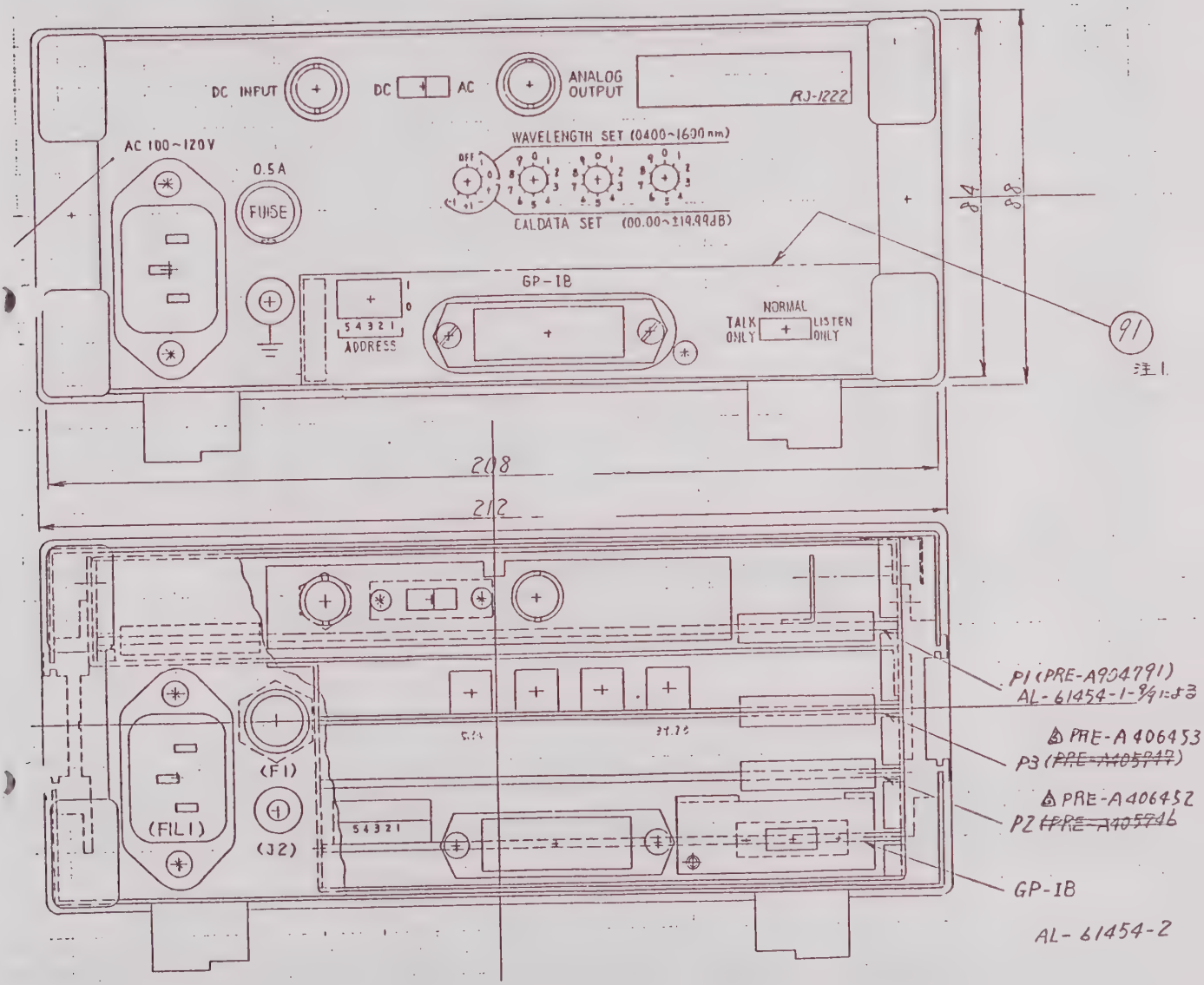
材料名	所要寸法	仕上および処理
設計 担当	検図	承認
尺度 1	AQ-1135E形光パワーメータ	
三角図法	筐体組立図	
指定なき寸法は普通公差とす	AL-61454-1	4/9

型 模範 治具 / 原版 / エキレイアウト / 組立図番 / 機能番号 / 客先No. / 部品 / 品名 / 一連No.

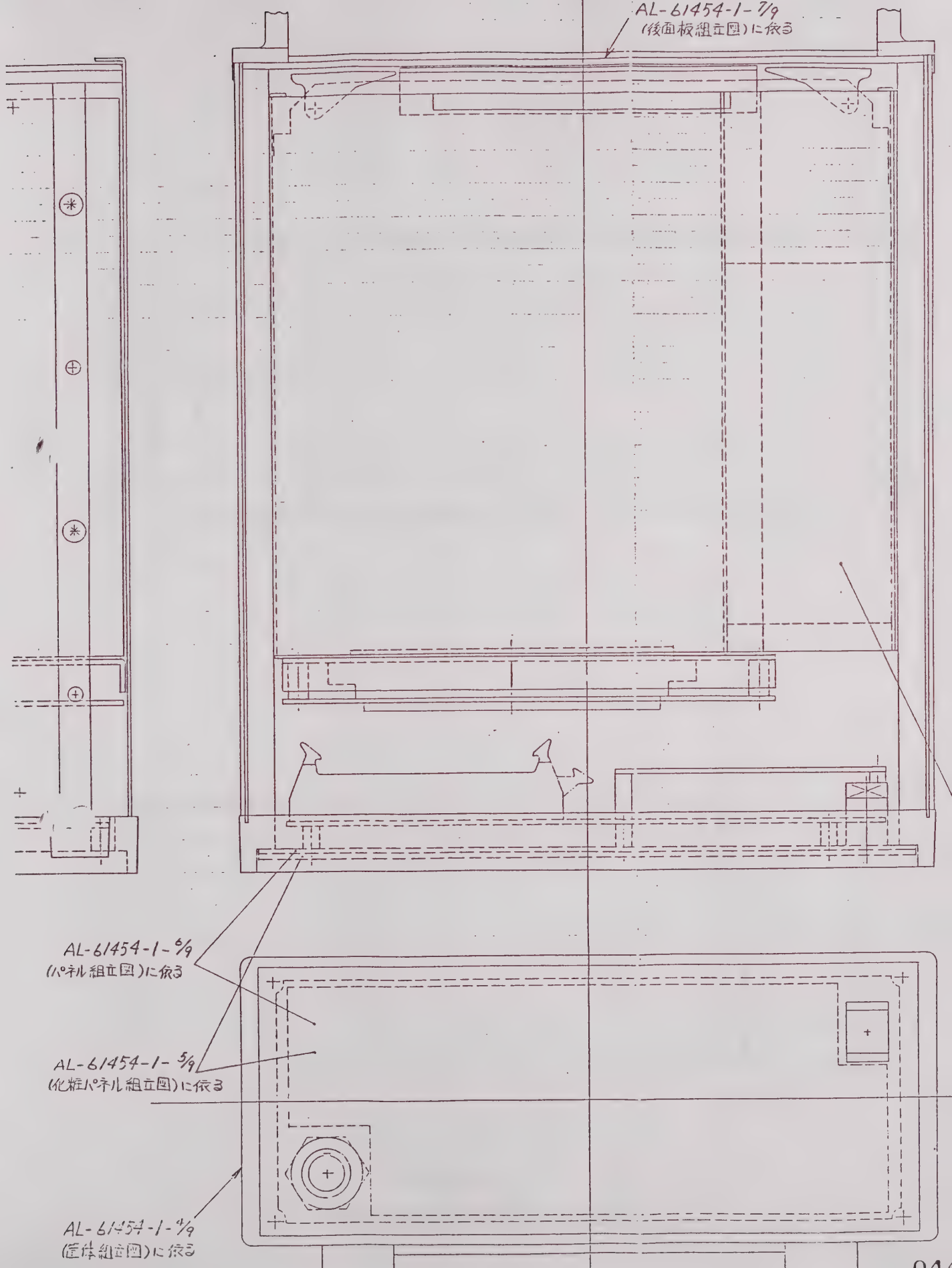
AL-61502-1 60.11.14 新年版 M/F AV 60.11.5

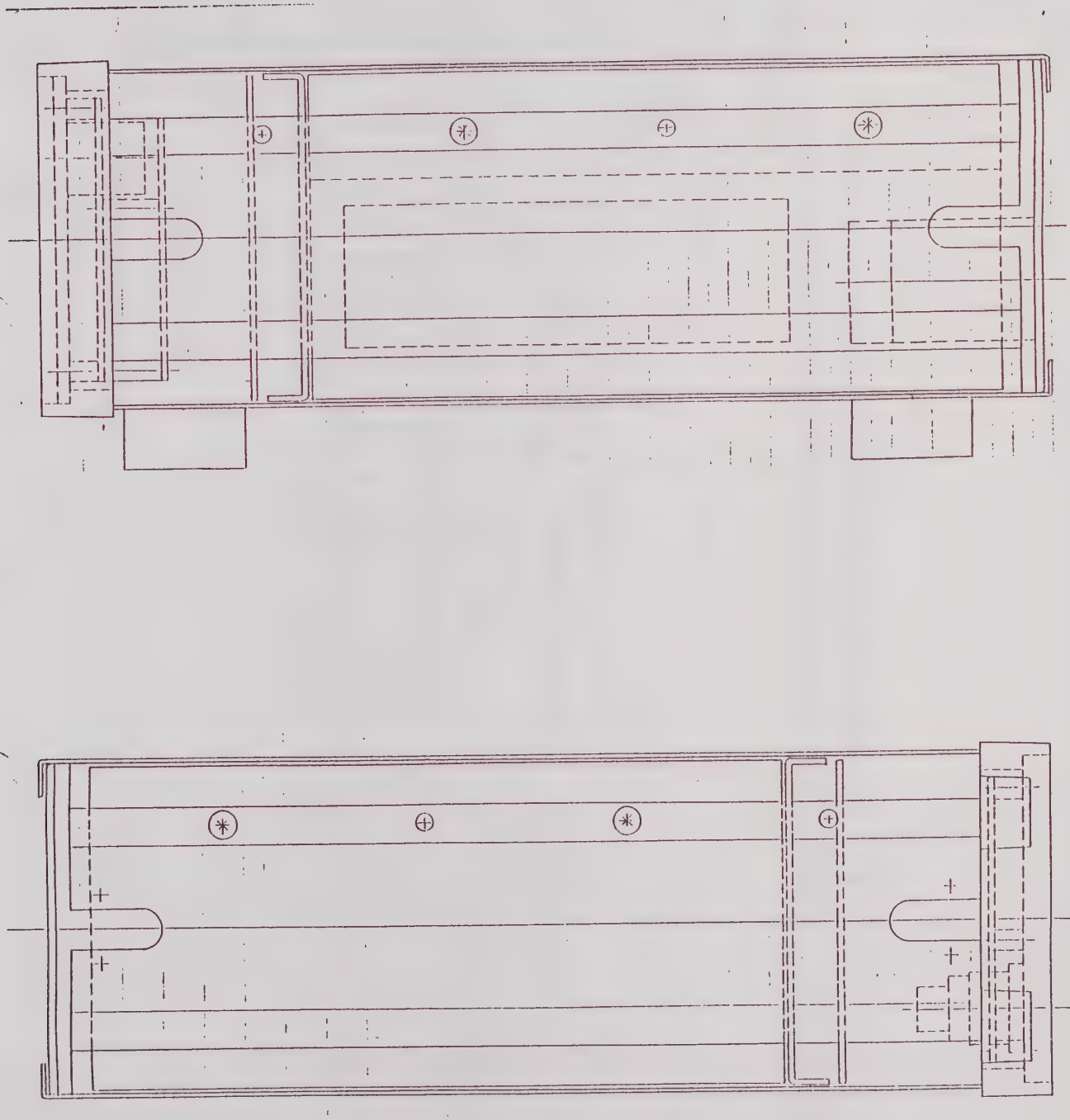
042

安藤電気株式会社



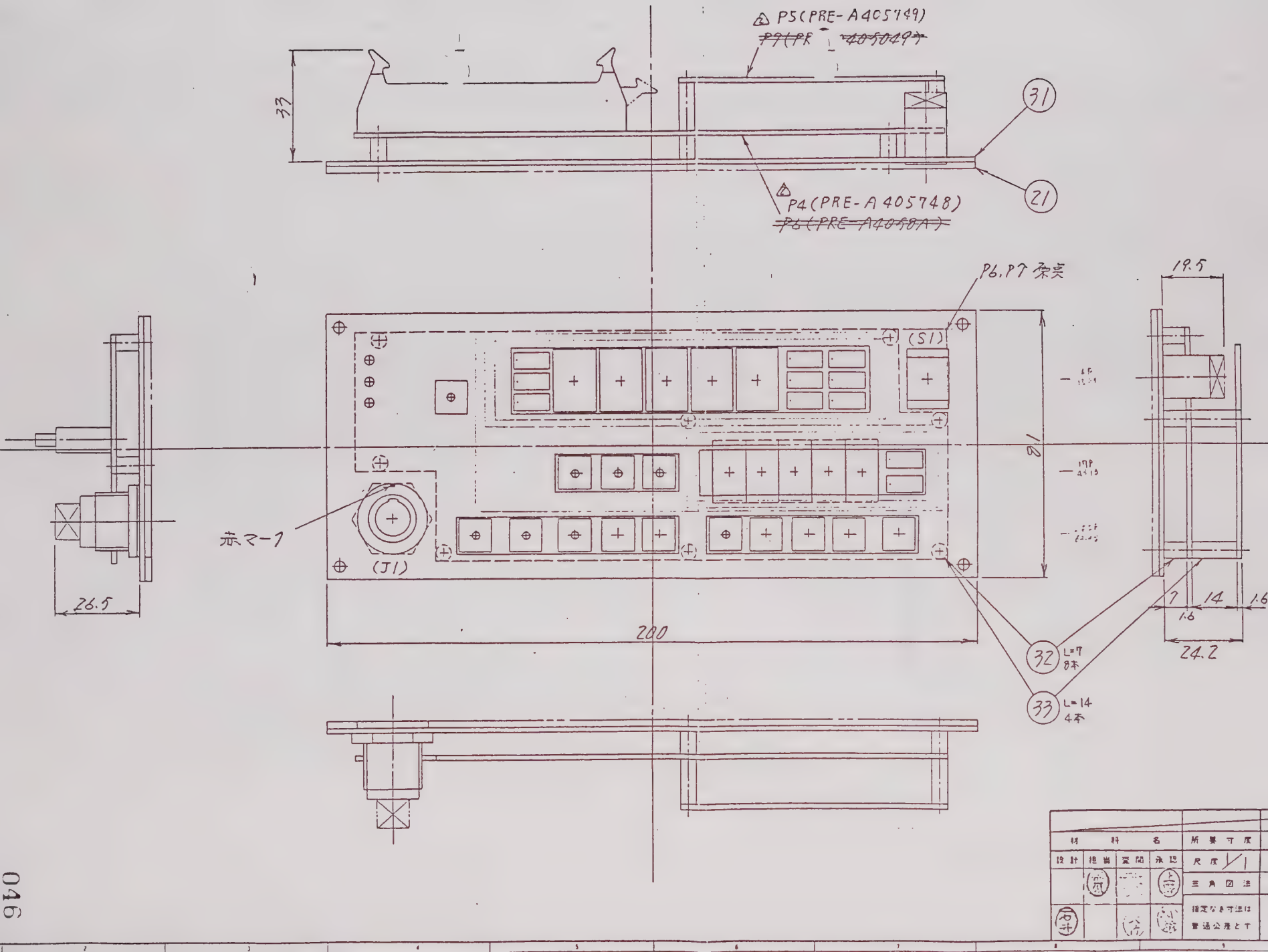
Internal Parts Arrangement Diagram


AL-61454-1-7/9
(後面板組立図)に依る
AL-61454-1-6/9
(パネル組立図)に依る
AL-61454-1-5/9
(化粧パネル組立図)に依る
AL-61454-1-4/9
(底体組立図)に依る



SIDE VIEW

Internal Parts Arrangement Diagram 1


△P5(PRE-A405749)
~~P9(PR~~ ~~405049~~
33
31
21
△P4(PRE-A405748)
~~P8(PRE-A40504~~
P6,P7 余突
19.5
(S1)
(J1)
赤マーク
26.5
200
181
7
14
1.6
1.6
24.2
32 L=7 8本
33 L=14 4本
材料名
設計
担当
査閲
承認
所要寸度
尺度 1/1
三角図法
指定なき寸法は普通公差とす

046

TEST RESULTS

OF

TYPE AQ-1135E OPTICAL POWER METER

NO.( )

Date;

Temp.; °C

Humidity; %

Approved by

Measured by

1. Mechanical Inspection

Specification: The product specification shall be complied with.

Test	Result
Composition	Good
marking	Good
Appearance and construction	Good
Mechanical performance	Good
Wiring and soldering	Good
Dimensions and weight	Good
Accessories	Good

2. Optical/Electrical Inspection

2.1 Power level measurement range

Specification:

AQ-1965 (1.3 μm) ..... -80 to 0 dBm/10 pW to 1 mW
AQ-1966 (0.85 μm) ..... -90 to 0 dBm/ 1 pW to 1 mW
AQ-1971 (1.3 μm) ..... -40 to +5 dBm/100 nW to 3 mW
AQ-1972 (0.85 μm) ..... -60 to +10 dBm/1 nW to 10 mW
AQ-1973 (1.3 μm) ..... -50 to +5 dBm/10 nW to 3 mW
AQ-1974 (0.85 μm) ..... -70 to +10 dBm/0.1 nW to 10 mW
AQ-1976 (0.63 μm) ..... -50 to +10 dBm/10 nW to 10 mW
AQ-1977 (1.3 μm) ..... -70 to +5 dBm/0.1 nW to 3 mW
AQ-1978 (0.85 μm) ..... -90 to +10 dBm/1 pW to 10 mW
AQ-1983 (1.3 μm) ..... -80 to 0 dBm/10 pW to 1 mW

Result	Good

2.2 Wavelength Correction Range

Specification: AQ-1965, AQ-1971, AQ-1973, AQ-1977, AQ-1983 — 1.00 to 1.60 μm

AQ-1966
AQ-1972
AQ-1974 — 0.40 to 1.00 μm
AQ-1976
AQ-1978

Result	Good

2.3 Measurement Accuracy (Sensor input: -23 dB)

Specification:
AQ-1965
AQ-1971
AQ-1973 — Within ±5% at 1.3 μm
AQ-1977
AQ-1983

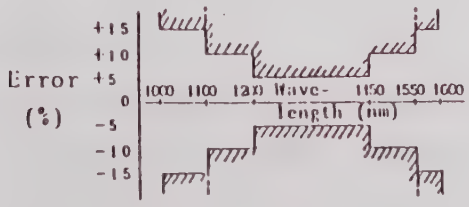
AQ-1966
AQ-1972
AQ-1974 — Within ±5% at 0.85 μm
AQ-1978

AQ-1976 — Within ±5% at 0.63 μm

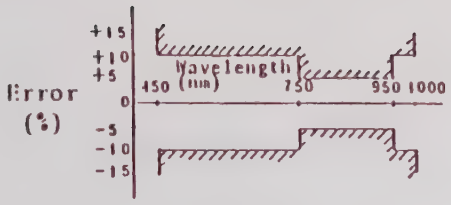
Result	Good

2.4 Wavelength Sensitivity Correction Error

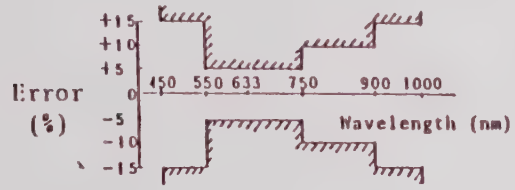
Specification:



(a) AQ-1965/AQ-1971/AQ-1973/AQ-1977/AQ-1983 (....)
Wavelength sensitivity correction error



(b) AQ-1966/AQ-1974/AQ-1972/AQ-1978 Wavelength sensitivity correction error



(c) AQ-1976 Wavelength sensitivity correction error

Result	Good

2.5 Output

Specification: Analog output 0 to about 2 V (for each range)

Output impedance 1 kΩ or less

Result	Good

2.6 Insulation Resistance

Specification: 5 MΩ or more when 250 VDC is applied between the power connector and the casing

Result	Good

Calibration Values

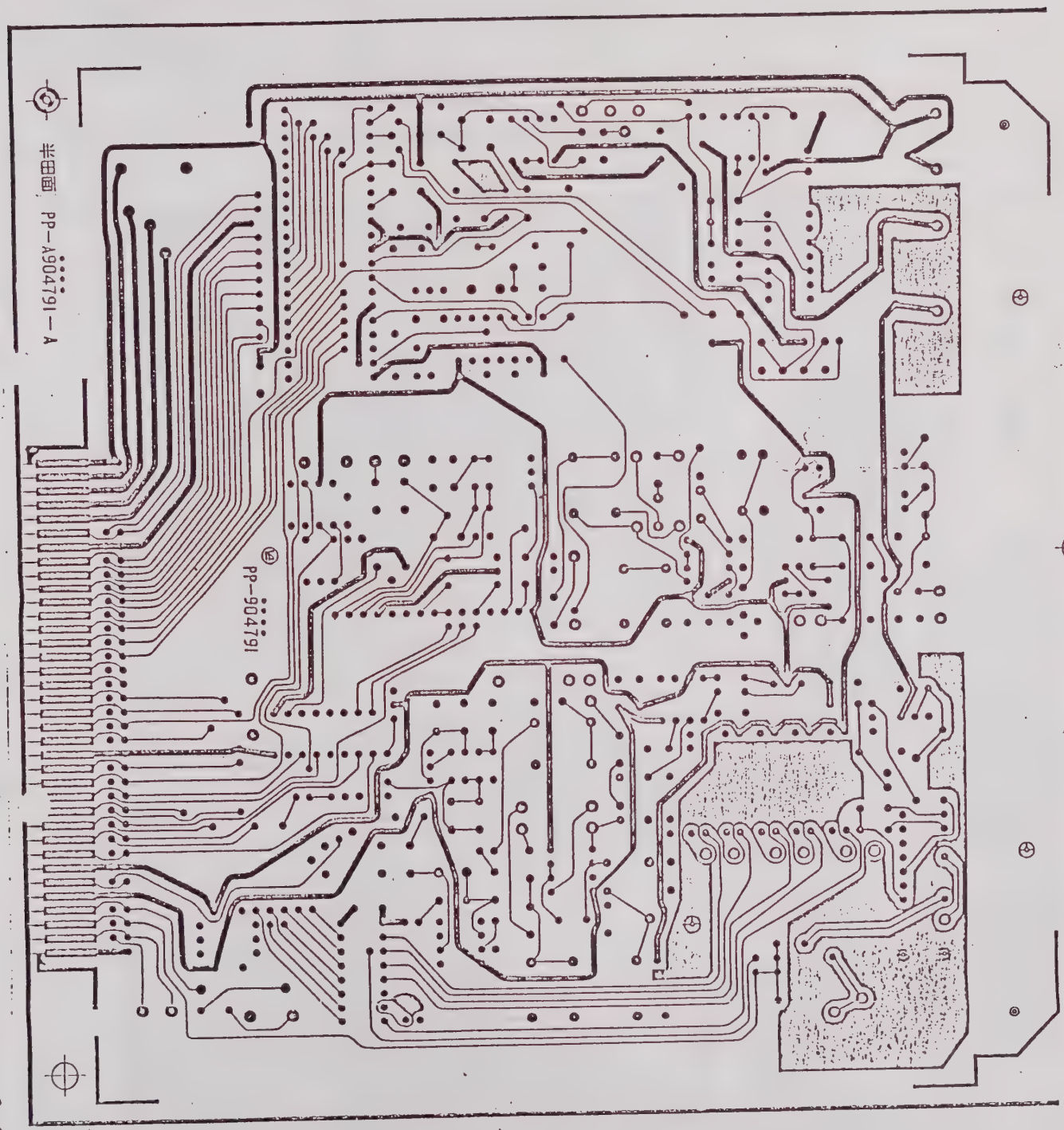
Standard	Sensor	Measurement	
-23.00 dBm	AQ-1965	CW light	dBm
	AQ-1966	CW light	dBm
	AQ-1971	CW light	dBm
	AQ-1972	CW light	dBm
	AQ-1973	CW light	dBm
	AQ-1974	CW light	dBm
	AQ-1976	CW light	dBm
	AQ-1977	270 Hz chopped light	dBm
	AQ-1978	270 Hz chopped light	dBm
	AQ-1983	270 Hz chopped light	dBm

PHS-A904791

052

PP-A904791-A

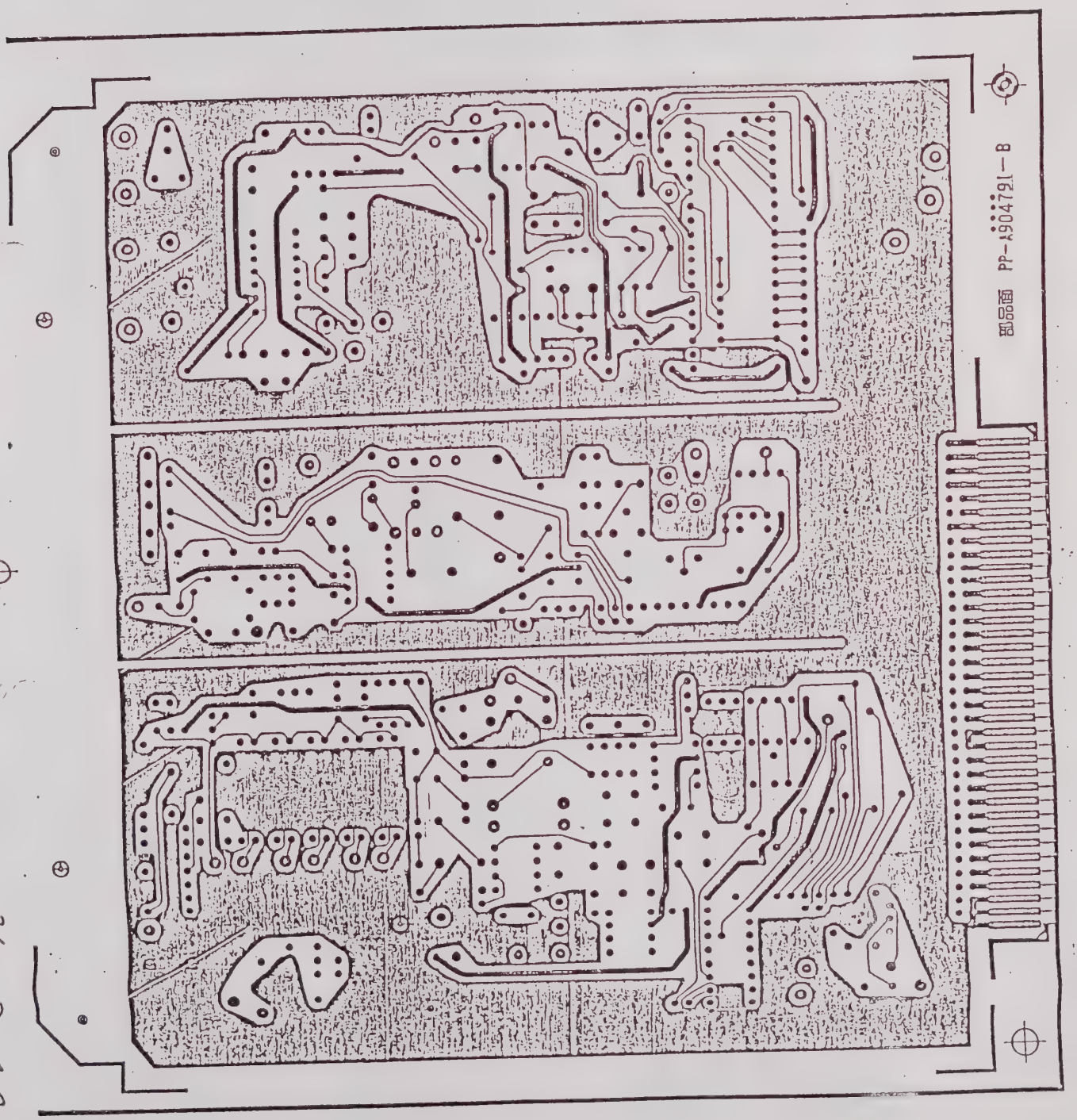
1. 59. 8. 24 新製
2. 59. 12. 28 T525-A923
3. 60. 4. 17 変更 T525-A060
4. 60. 6. 18 変更 T525-A132-3



2/1 PP-A904791-A

PP-A904791-B

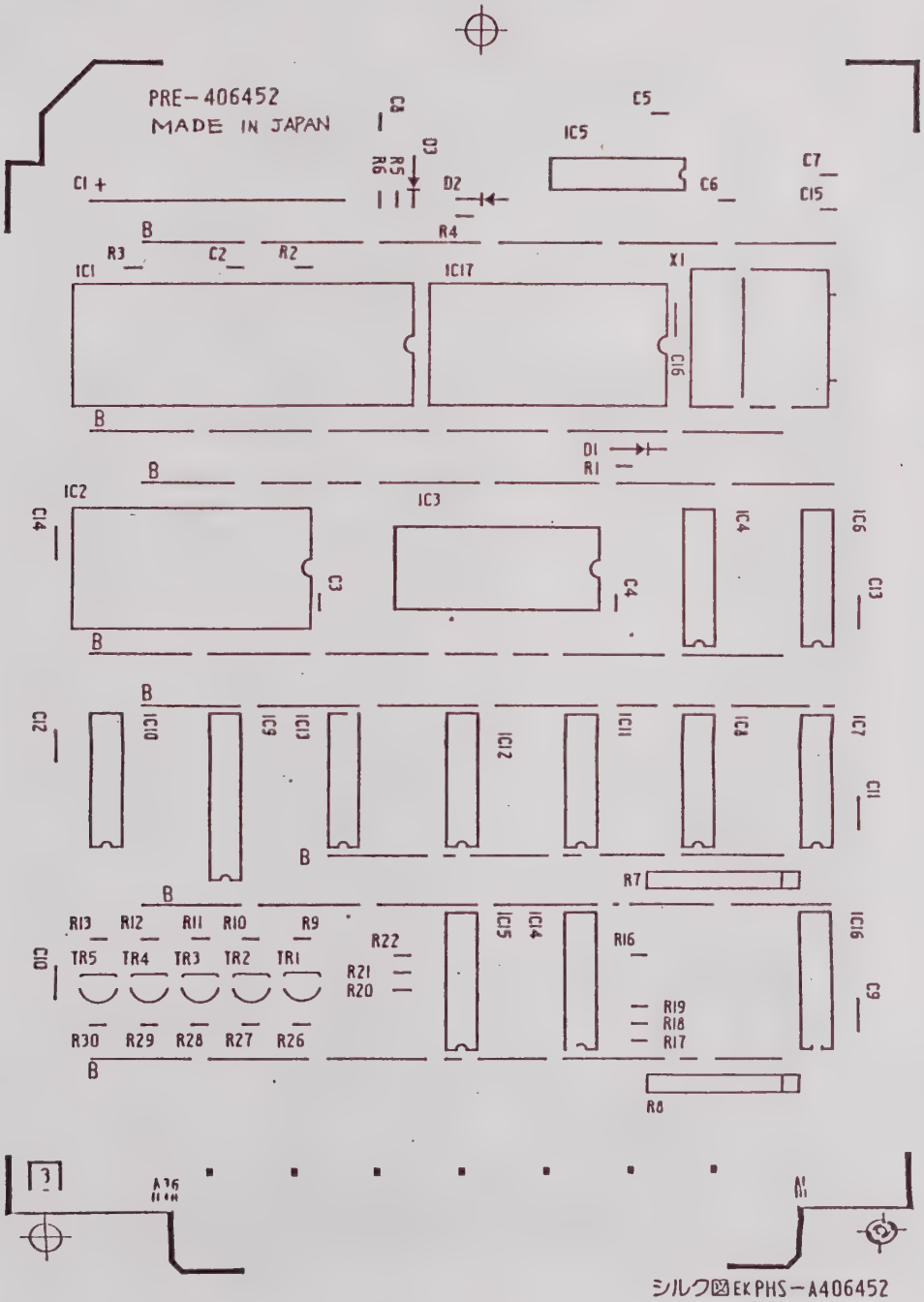
1. 59. 8. 24 新規
2. 59. 12. 28 T525-A923
3. 60. 4. 17 T525-A060
4. 60. 6. 18 変更 T525-A132-3



2/1 PP-A90-

PHS-A406452

1. 49.7.23 新製
2. 59.12.20 変更 T525-A923-1
3. 61.1.31. 変更 T525-A495



シルク図EK PHS-A406452

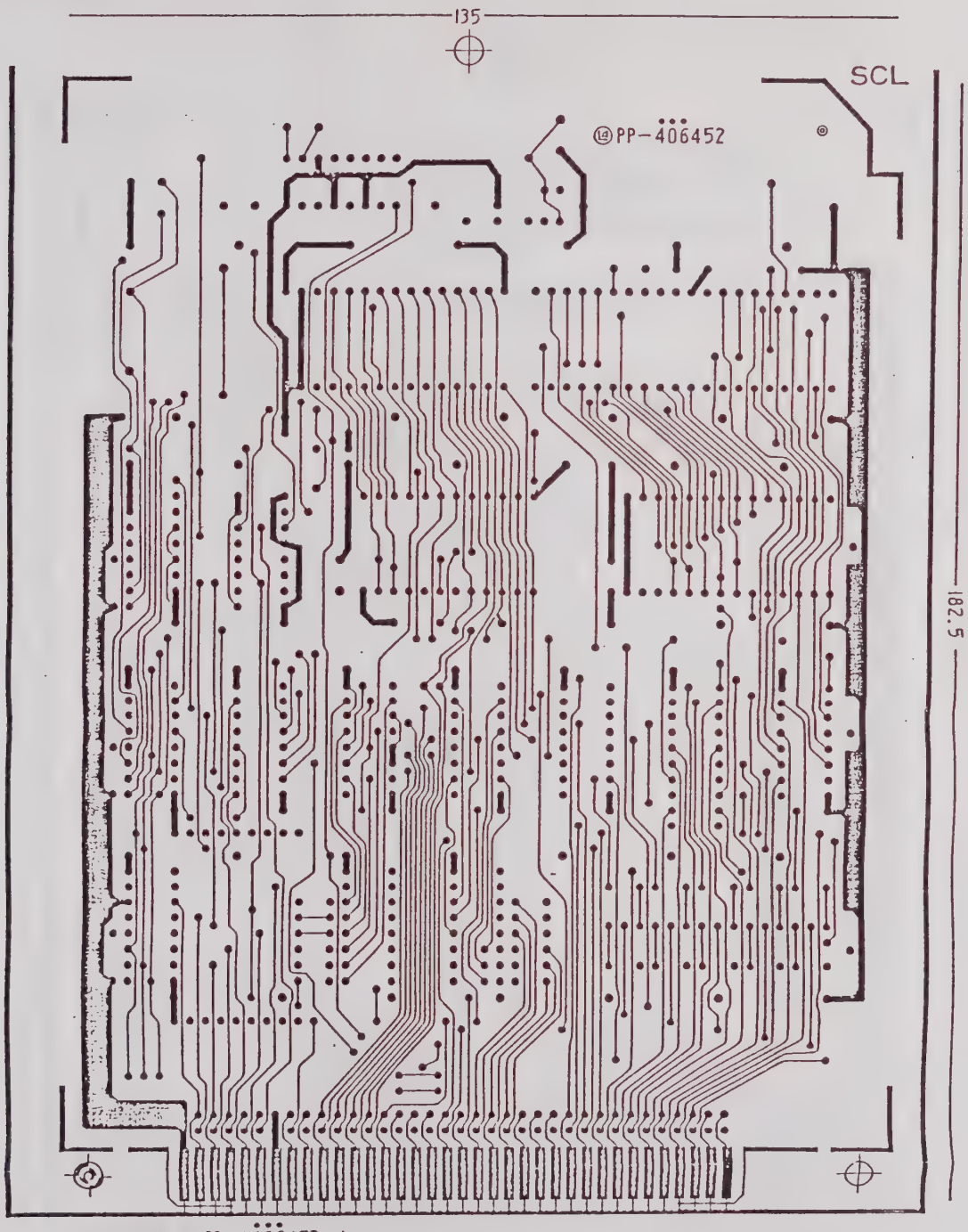
承認します

T525			
61.2.			

3/1 PHS-A406452

PP-A406452-A

1. 59. 7. 23 新記
2. 59. 12. 13 全面 T525-A923-1
3. 61. 1. 31 変更 T525-A495



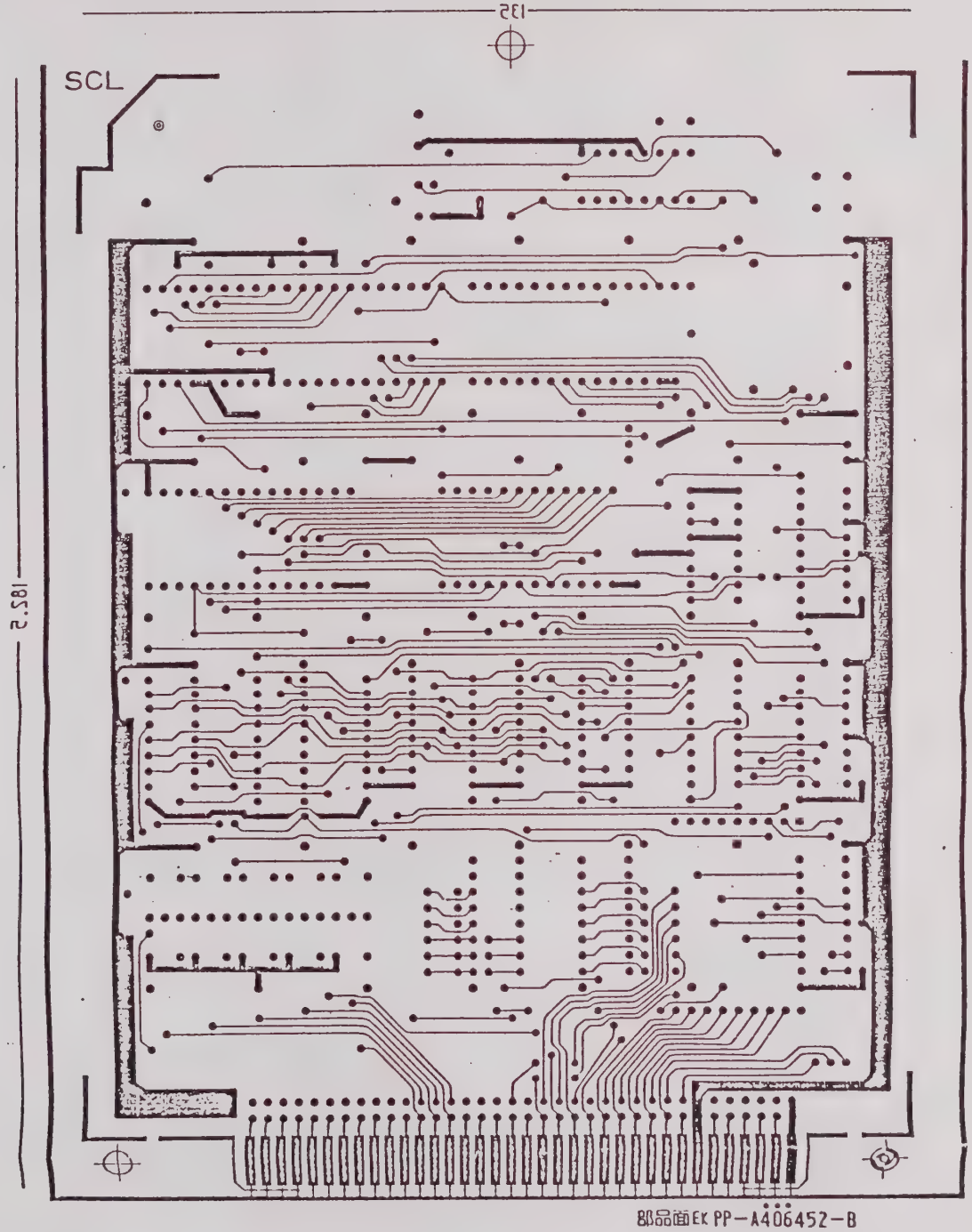
半田面 Ex PP-A406452-A

承認しません			
T525			
61. 2. 3			

2/1 PP-A406452-A

PP-A406452-B

1. 59. 7. 23 新設
2. 59. 12. 13 変更 T525-A123-1
3. 61. 1. 21 変更 T525-A495



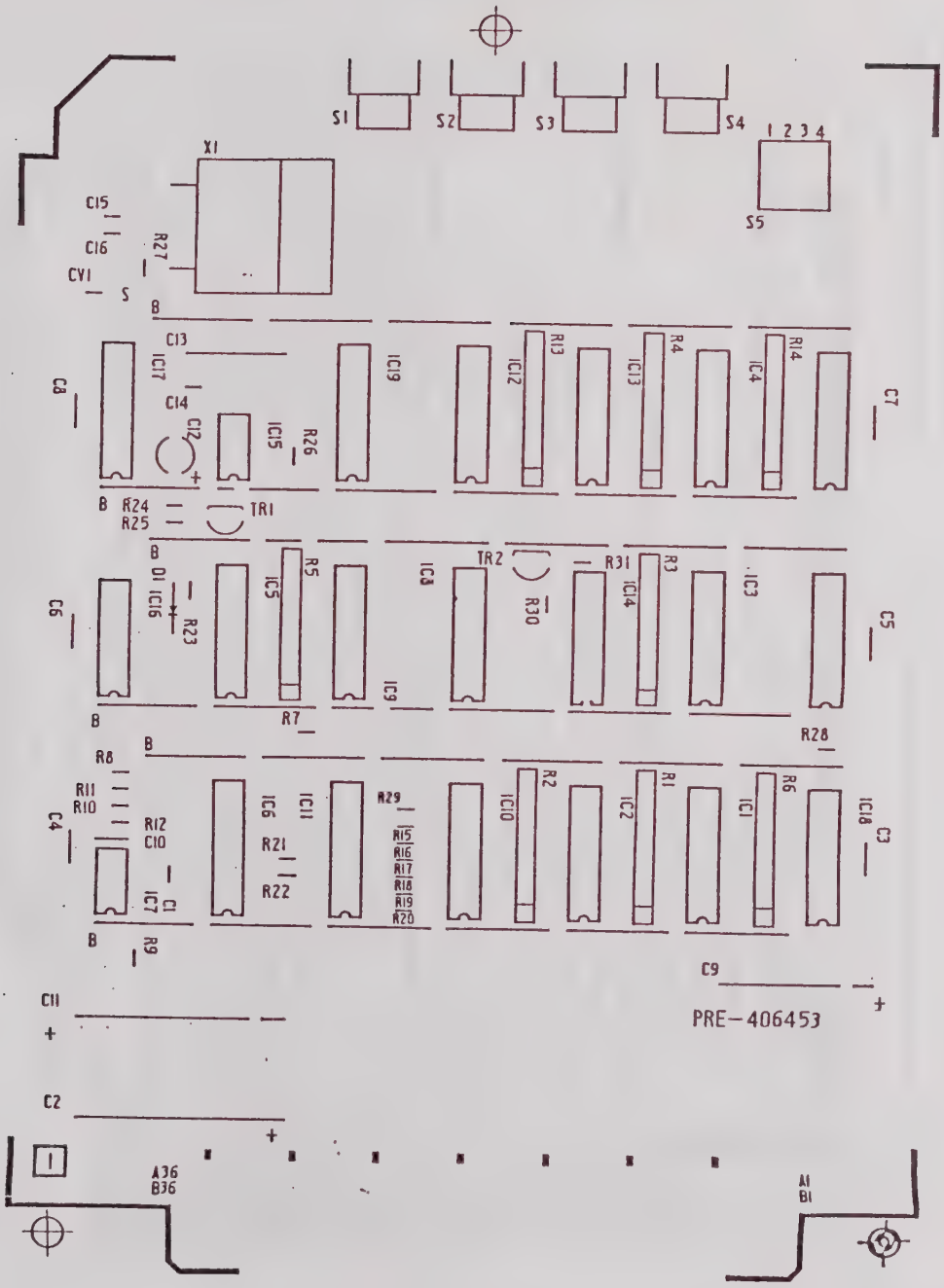
80品面Ex PP-A406452-B

承認します			
T525			
61. 2. 3			

3/1 PP-A406452-B

PHS-A406453

1.11.7.23 村松



シルク図 PHS-A406453

2/1 PHS-A406453 SC

承認しました			
日付	59.8.13	T455	

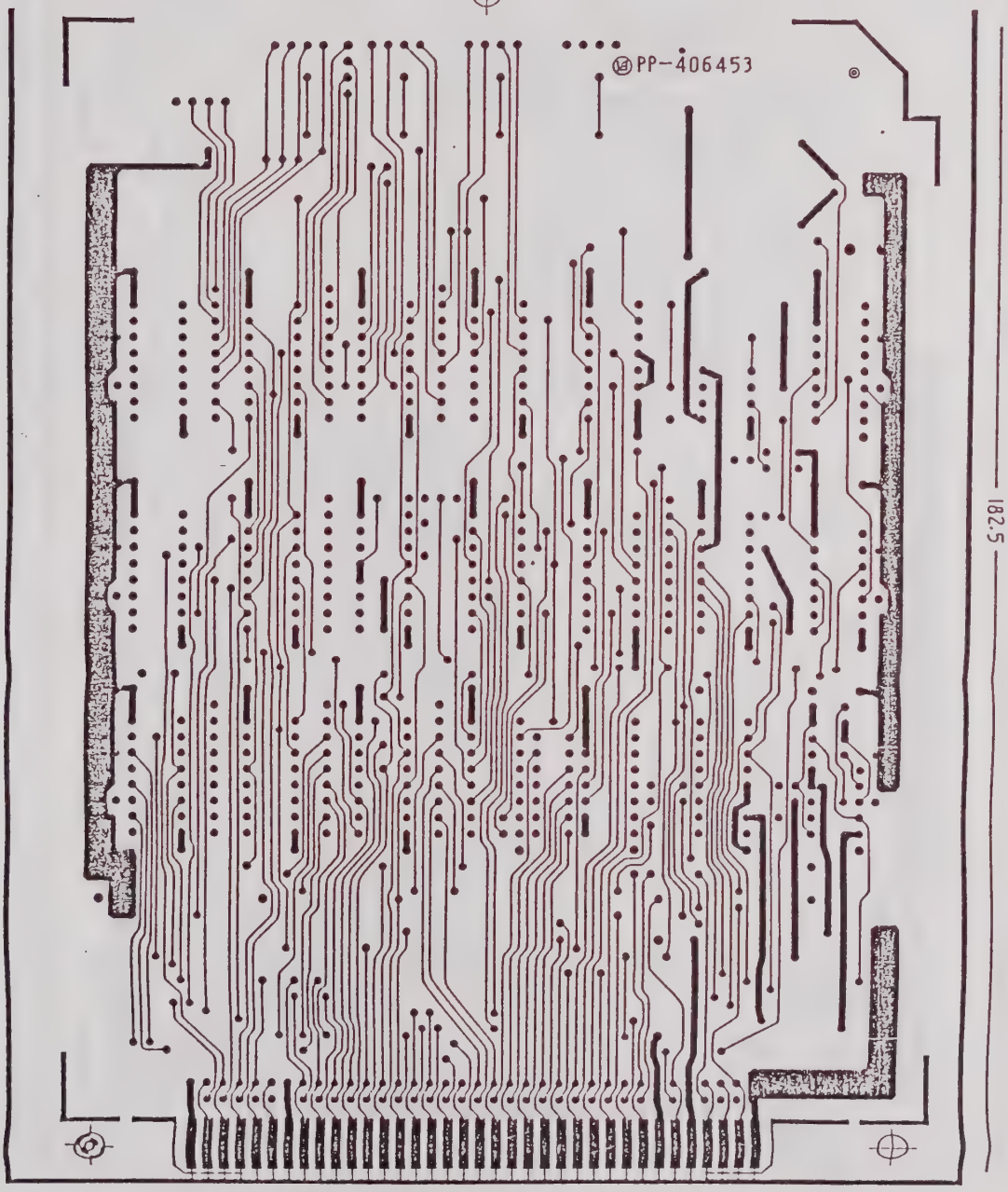
058

Pr-A406453-H

1.59.7.23 新装

EK

135



半田面 PP-A406453-A

承認しません		
		名機製作所
		T455
		59.8.13

2/1 PP-A406453-A SC

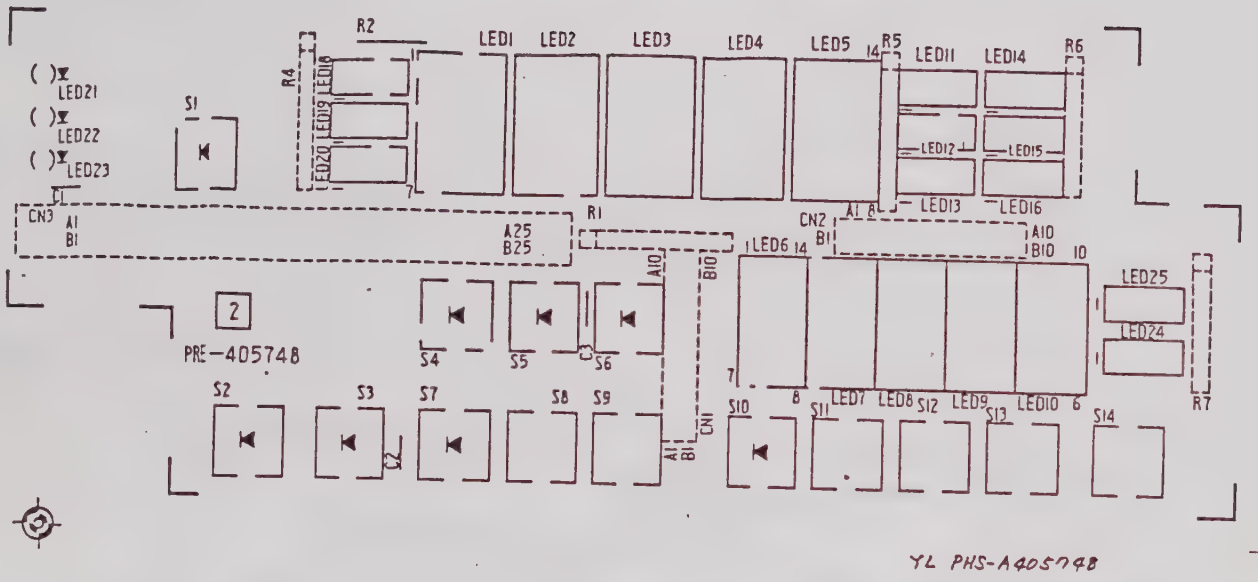
PP-A406453-B

部品面 PP-A406453-B

設計	作図	検図	承認	日付
				59.8.13

プリント基板

2/1 PP-A406453-B SCL



YL PHS-A405748

PHS-A405748

2/1 PHS-A405748 SCL

承認しません			
	上長	係長	担当者
T455	定	今川	吉
日付 09.3.19			

部品面シルク

PP-A405748-A

1.58. 8.10. NEW
2.59. 3. 8. 変更 TK社-A543

2/1 PP - A405748-A - SCL

承認しるし		
T45		
59.3.19		

無断複製禁止

PP-A405748-B

1.58. 8. 10. NEW
2.59. 3. 8. 変更 TK11-A513

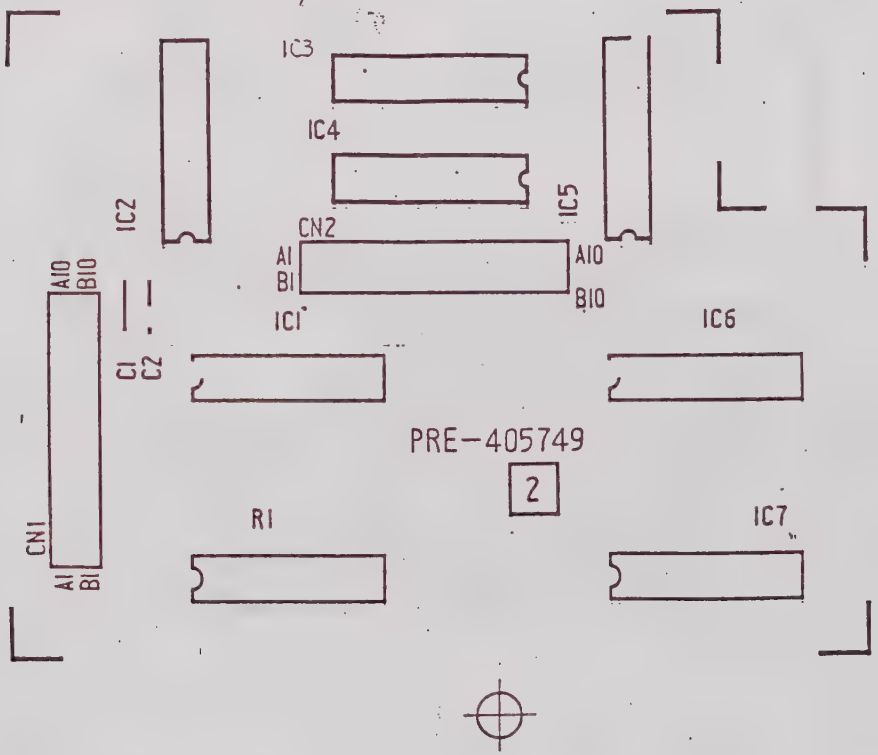
2/1 PP - A405748-B SCL

部品面

承認します
実装電気株式会社 | 担当 | 係長 | 課長
T455
59. 3. 19

60.5/28 対応を行ないます
7.このパターン変更を依頼す(承認済) (H)

TL PHS-A405749



PHS-A405749

1.58.8.10. NEW
2.59.3.8. 変更 T455-A516

2/1 PHS-A405749 SCL

064

PP-A405749-A

1. 58. 8. 10 NEW
2. 59. 3. 8. 変更 TK55-1566

改訂した寸法			
改訂記号	改訂内容	日付	担当者
T455			
59. 3. 19			

TL PP-A405749-A

2/1 PP - A405749-A SCL

PP-A405749-B

1.58.8.10 NEW
2.59.3.8. T455-A556

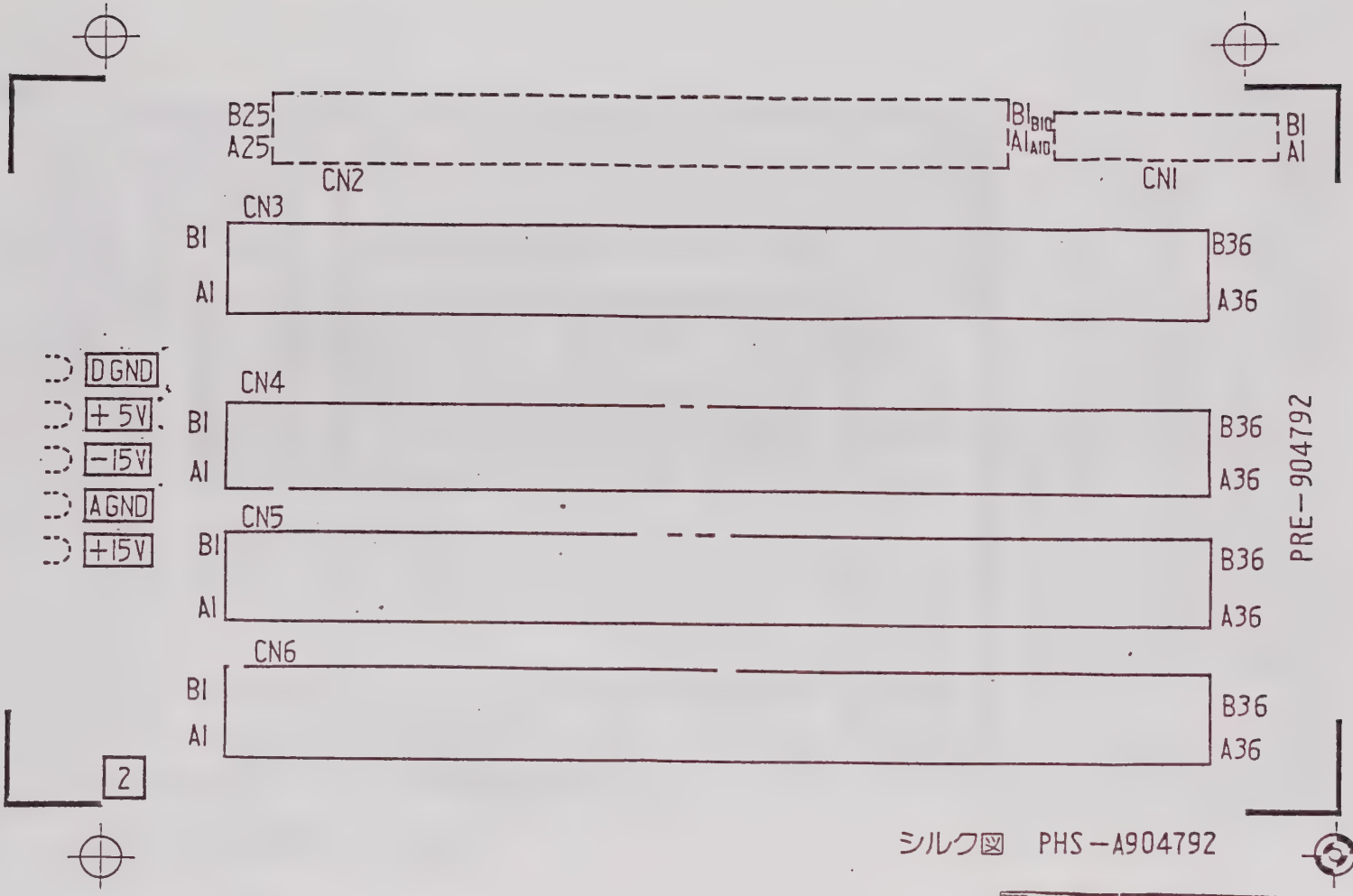
改訂しるす				
B	59.3.19	T455		

部品面

YL PP-A405749-B

2/1 PP - A405749-B SCL

S/1



シルク図 PHS−A904792

承認します			
安藤電気株式会社 課長		主任	担当者
T525			
日付 59.12.17			

2/1 PHS-A904792 SCL

2.59.12.13 変更 T525-A923-1

290

承認します			
安藤電気株式会社		手	表面
(計)二技 K263			
日付 61.2.14			

2/1 PP-A904792-A SCL

890

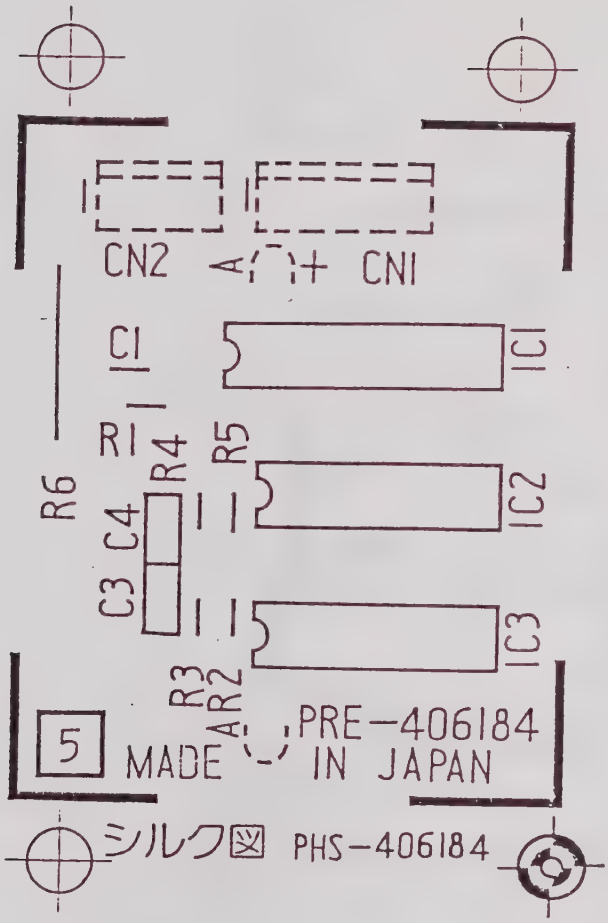
2. 59. 12. 13 変更 TS25-A923-1
3. 60. 4. 17 変更 TS25-A060
4. 61. 2. 7 変更 K363-B079

SCL 部品面 PP-A904792-B

2/1 PP-A904792-B SCL

690

1. 59. 8. 24 新 規
2. 59. 12. 13 変 更 T525-A723-1
3. 60. 4. 17 変 更 T525-A060
4. 61. 2. 7 変 更 K363-B089



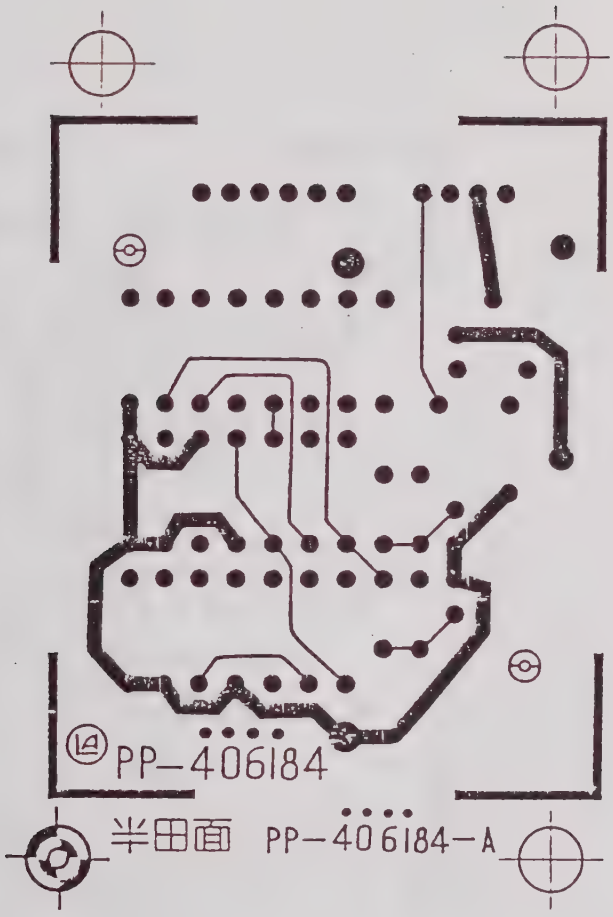
シルク図 PHS-406184

承認します			
安藤 ㈱代表取締役社長		主任	担当
T525			
日付 60.3.5			

2/1 PHS-406184

070

5.60.2.25 申請 T525-A015

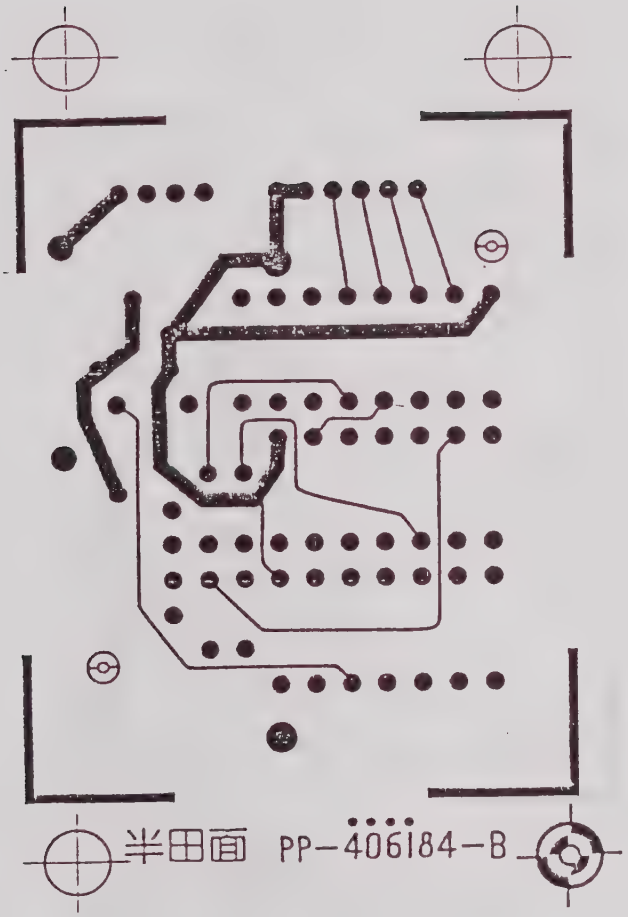


承認します			
安藤電気株式会社 課長		係長	担当者
T525			
日付 60.3.5			

071

2/1 PP-406184-A

60.2.25 再製 T525-A015



承認します			
安藤電気株式会社 社長		担任	担当
T525			
日付 60.3.5			

072

PP-406184-

60.2.25 再製 T525-A015

シルク図

PHS-A200636

073

59. 3. 22	再製	T455-A6
59. 6. 12		T455-A6
59. 9. 8	変更	T455-A788

承認します			
安藤電気株式会社	課長	係長	担当者
T525		(会)	
日付 59. 9. 19			

24PHS-200636

PP-A200636

T455-A676
T455-A788

T455-A676.2

59. 3. 22	再製
59. 6. 12	変更
59. 9. 8	

T525	
59. 9. 19	

2/2 PP-200636

シルク図 PHS-200637

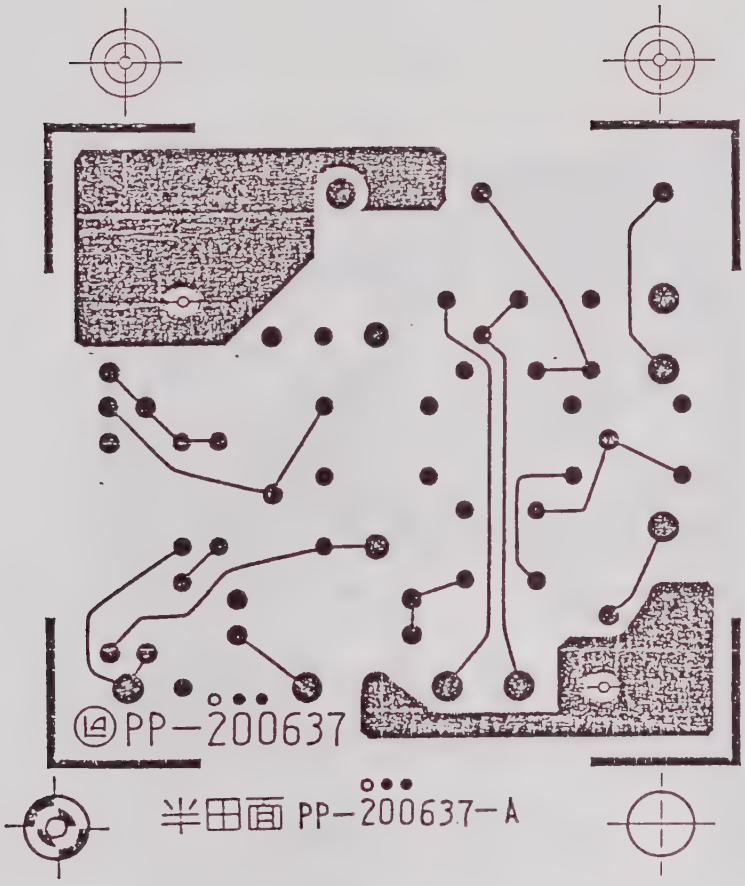
承認します			
安藤[illegible]株式会社[illegible]長		[illegible]	[illegible]当者
T525			
日付	60.3.6		

075

SCL

2/ PHS-200637

60. 2. 25 再製 T525-A0



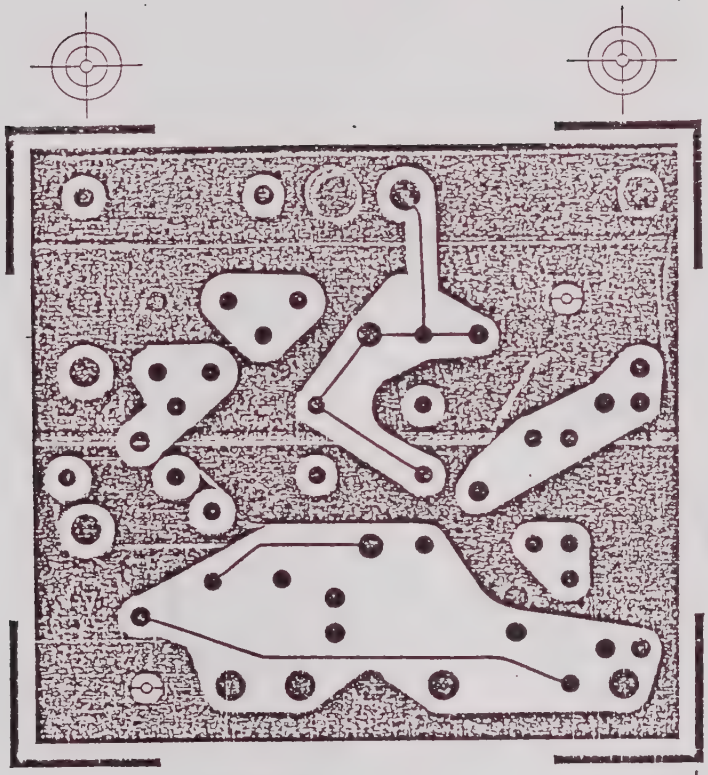
6. 60.2.25 再製 T525-A01
7. 60.6.4 変更 T525-A120

承認します			
安藤電気株式会社	課長	主任	担当者
T525			
60.6.6			

076

SCL

2/1 PP-200637-A



部品面 PP-200637-B

6. 60.2.25 作成 T525-A015
7. 60.6.4 変更 T525-A120

承認します			
安藤電気株式会社	課長	主任	担当者
T525			
日付 60.6.6			

077

SCL

2/4 PP-200637-B

1. 59. 3. 28 新製
2. 61. 6. 19. 再製. 363-B2)

承認しるし			
安藤電気株式会社	新旧	主任	担当
(計)二技 K363			
日付 61.6.23			

078

2/1 PHS-904713

承認	作成
K363	
61. 6. 23	

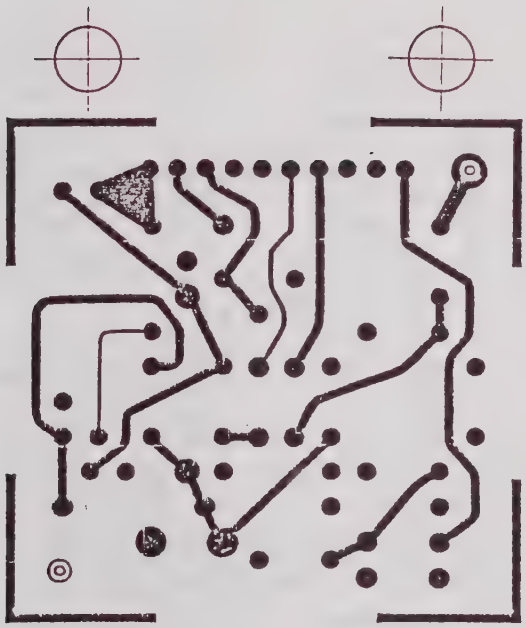
PHS-A200653
シルク図

2. 59. 3. 27 再製
3. 59. 6. 12 T455-A673
4. 59. 6. 29 T455-A715
5. 59. 11. 9 T525-A894-4

承認します		
T525		
59. 11. 9		

080

2/1 PHS-A200653



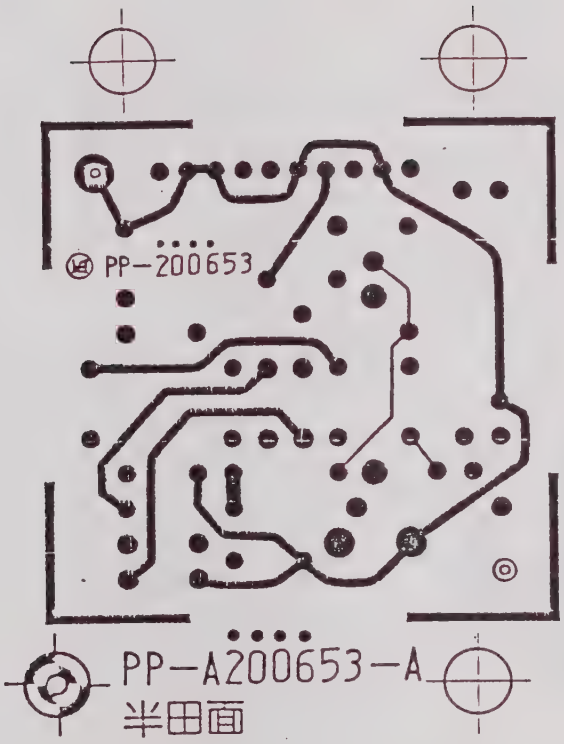
PP-A200653-B
部品面

2. 59. 3. 27 再製
3. 59. 6. 12 T455-A673
4. 59. 11. 9 T525-A894-4

承認します			
	T525		
日付	59. 11. 9		

081

2/4 PP-A200653-B



59.3.27 再製
59. 6. 12 T455-A673
59. 11. 9 T525-A894-4

承認します			
	T525		
日付	59.11.9		

082

24 PP-A200653-A

PHS-A200654
シルク図

承認します。		
T525		
59.11.9		

2. 59. 3. 27 再製
3. 59. 6. 12 T455-A673
4. 59. 6. 29 T455-A715
5. 59. 11. 9 T525-A896-4

2/ PHS-A200654

シルク図

PHS-A200680

1.59.7.5 新規
2.59.11.9 変更 T525-A893-4
3.60.4.17 変更 T525-A076

承認します			
安藤電気株式会社	設計	主任	担当者
T525			
日付 60.4.18			

2/1 PHS-A200680

承認します			
設計 株式会社	課長	主任	担当
T525			
日付 59.11.9			

59.7.5 新製
59.11.9 変更 7525-A893-4

PP-A200680-B

59. 7. 5 新製
59. 11. 9 変更 T525-A893-4

承認します			
T525			
日付 59. 11. 9			

086

21-PP-A200680-B

Parts List

ABBREVIATION

A: ampere
ADJ: adjustment
AL ELECT: aluminum electrolytic
CAP: capacitor
CB FLM: carbon film
CER: cermic
CMOS: complementary metal-oxide semiconductor
F: farad
FXD: fixed
Hz: hertz
IC: integrated circuit
LED: light-emitting diode
m: meter (distance)
MET FLM: metal film
NPN: negative-positive-negative
RES: resistor
SI: silicon
V: volt
VAR: variable
W: watt
WW: wire wound
Ω: ohm

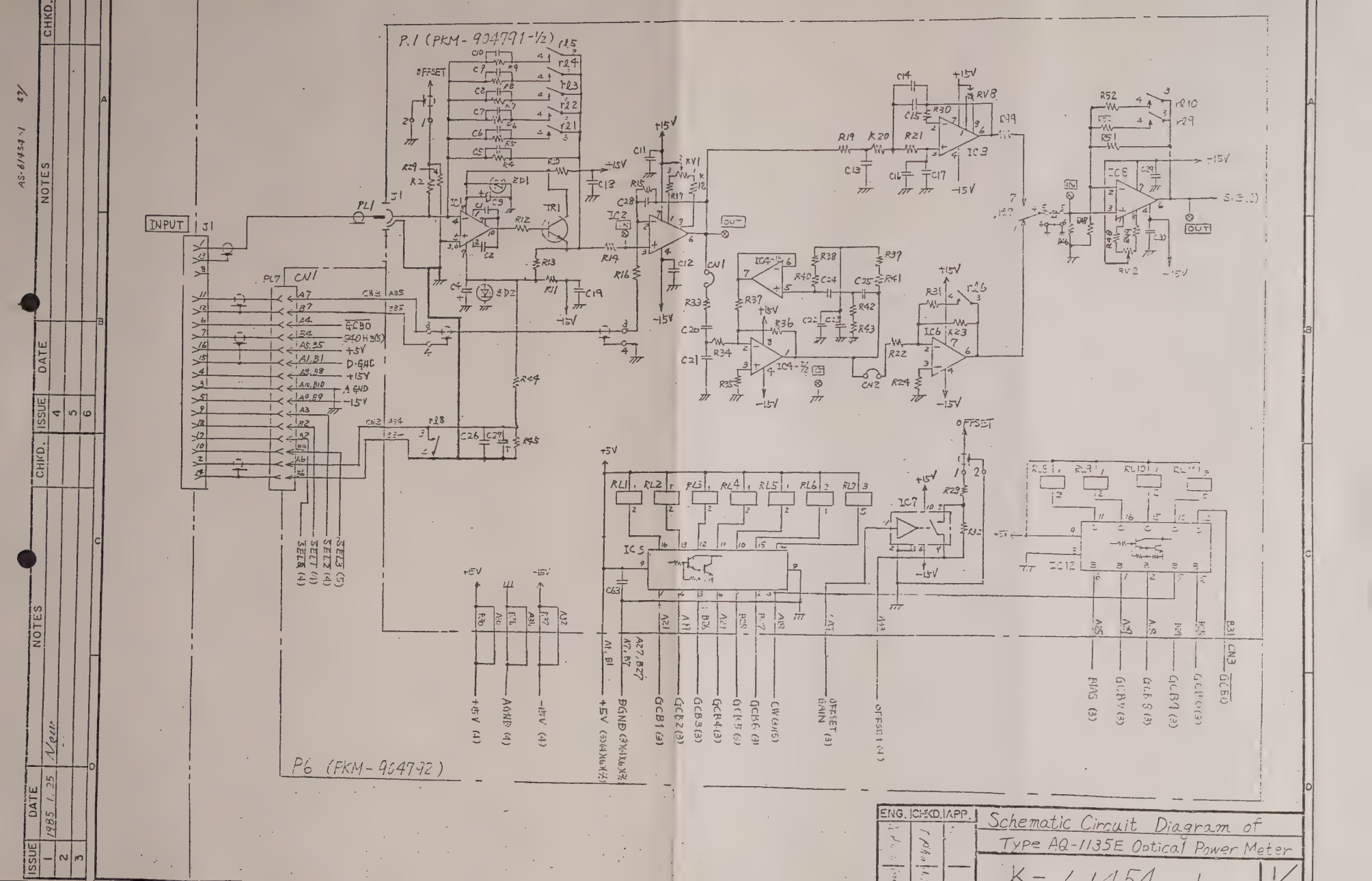
MULTIPLIERS

Abbreviation	Prefix	Multiple
G	giga	10^{9}
M	mega (meg)	10^{6}
K	kilo	10^{3}
m	milli	10^{-3}
μ	micro	10^{-6}
n	nano	10^{-9}
p	pico	10^{-12}

Parts List

CIRCUIT REFERENCE

C: capacitor
CN: connector
F: fuse
IC: integrated circuit
LED: light-emitting diode
P: printed circuit boar
PS: power supply
R: resistor
RV: resistor, variable
S: switch
TR: transistor
X: crystal oscillator
ZD: zener diode



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1	1985 / 2 / 25	New
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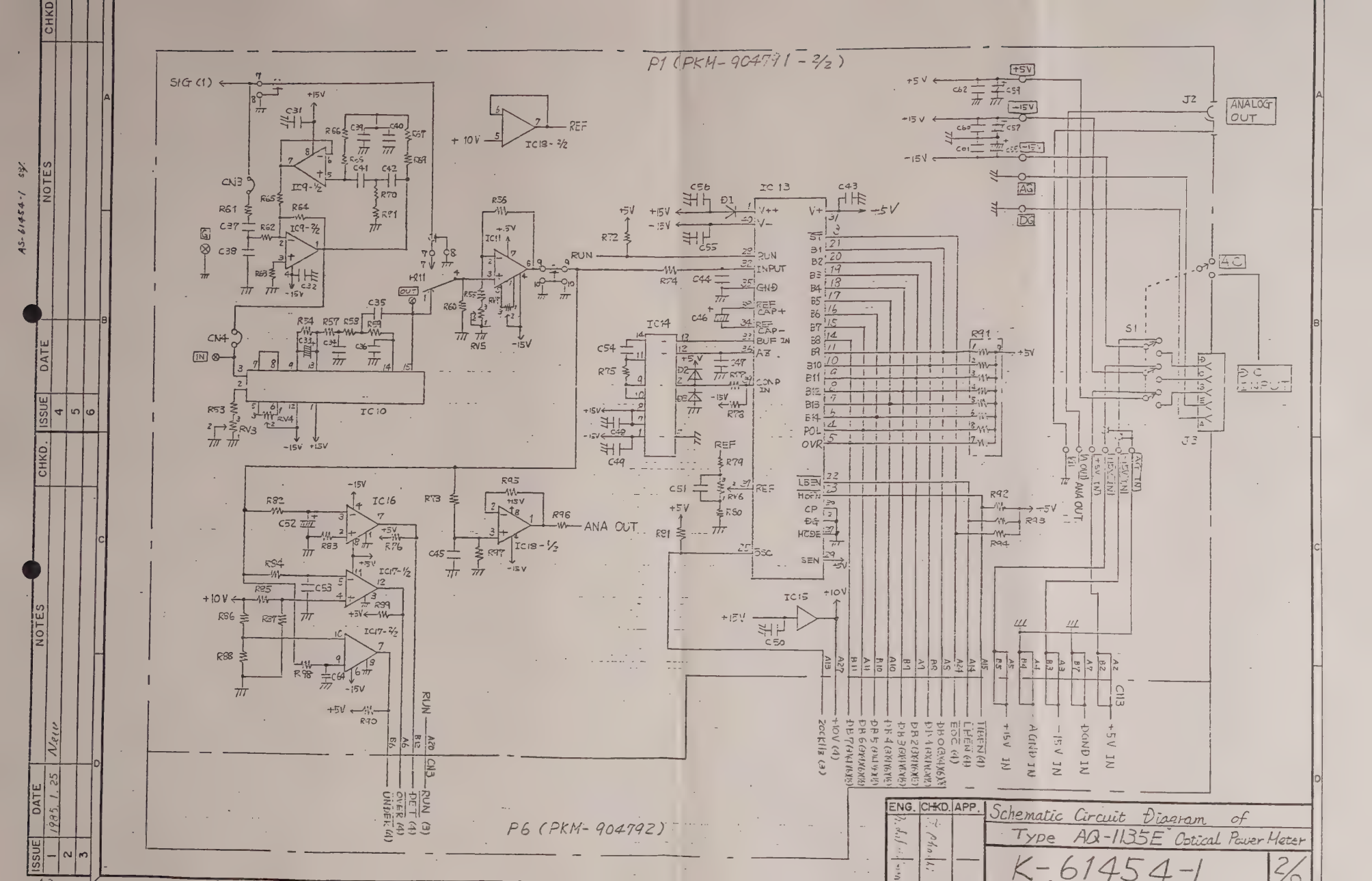
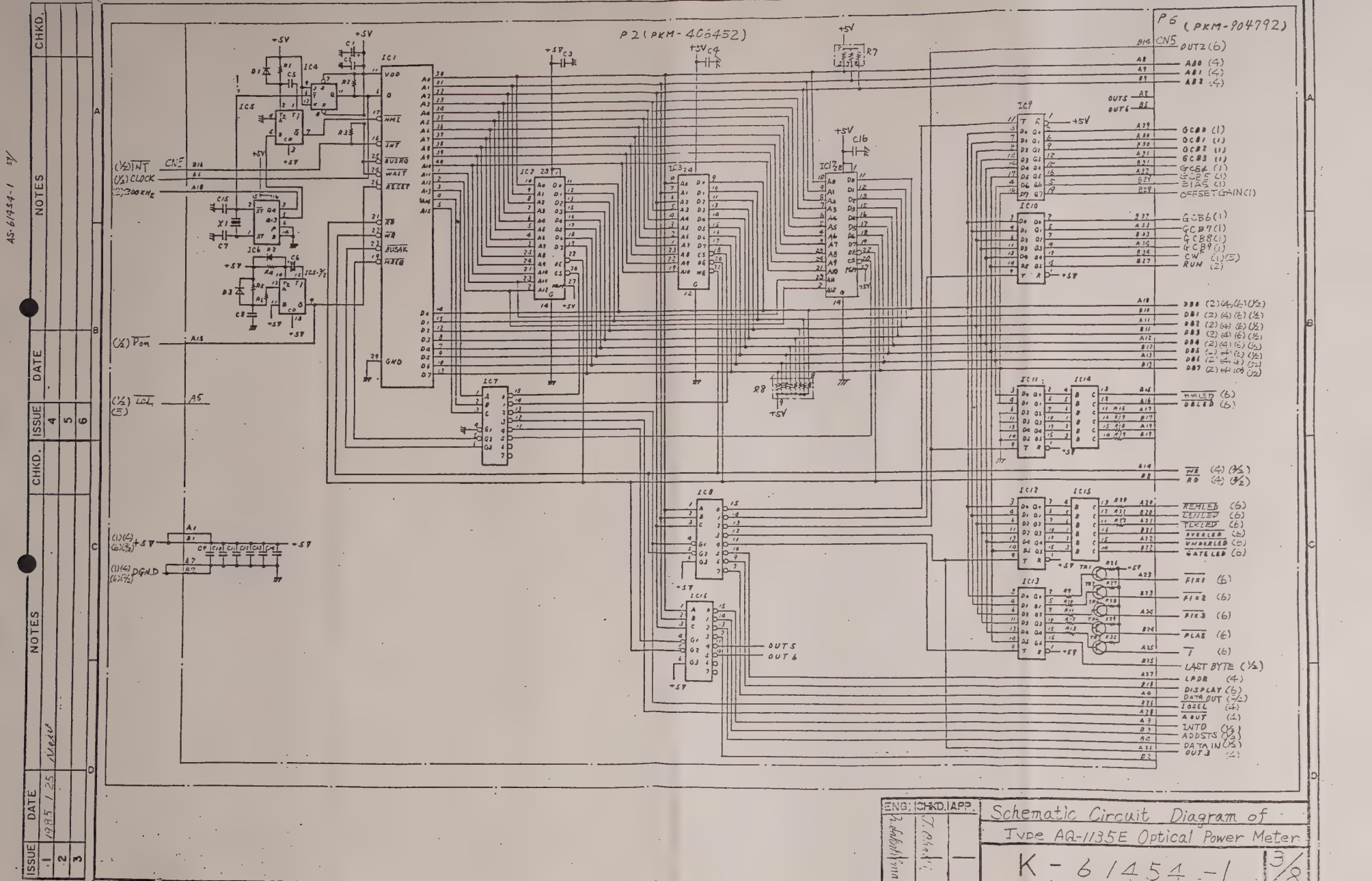
Schematic Circuit Diagram of
Type AQ-1135E Optical Power Meter

K-6/454 1/


P1 (PKM-904791 - 2/2)
SIG (1)
IC9-1/2
IC9-2/2
IC10
IC11
IC13
IC14
IC15
IC16
IC17-1/2
IC17-2/2
IC18-1/2
IC18-2/2
RUN
INPUT
GND
REF
REF CAP+
REF CAP-
BUF IN
CAP IN
ANA OUT
ANALOG OUT
J2
J3
S1
P6 (PKM-904792)
ENG.
CHKD.
APP.
Schematic Circuit Diagram of
Type AQ-1135E Optical Power Meter
K-61454-1
2/2



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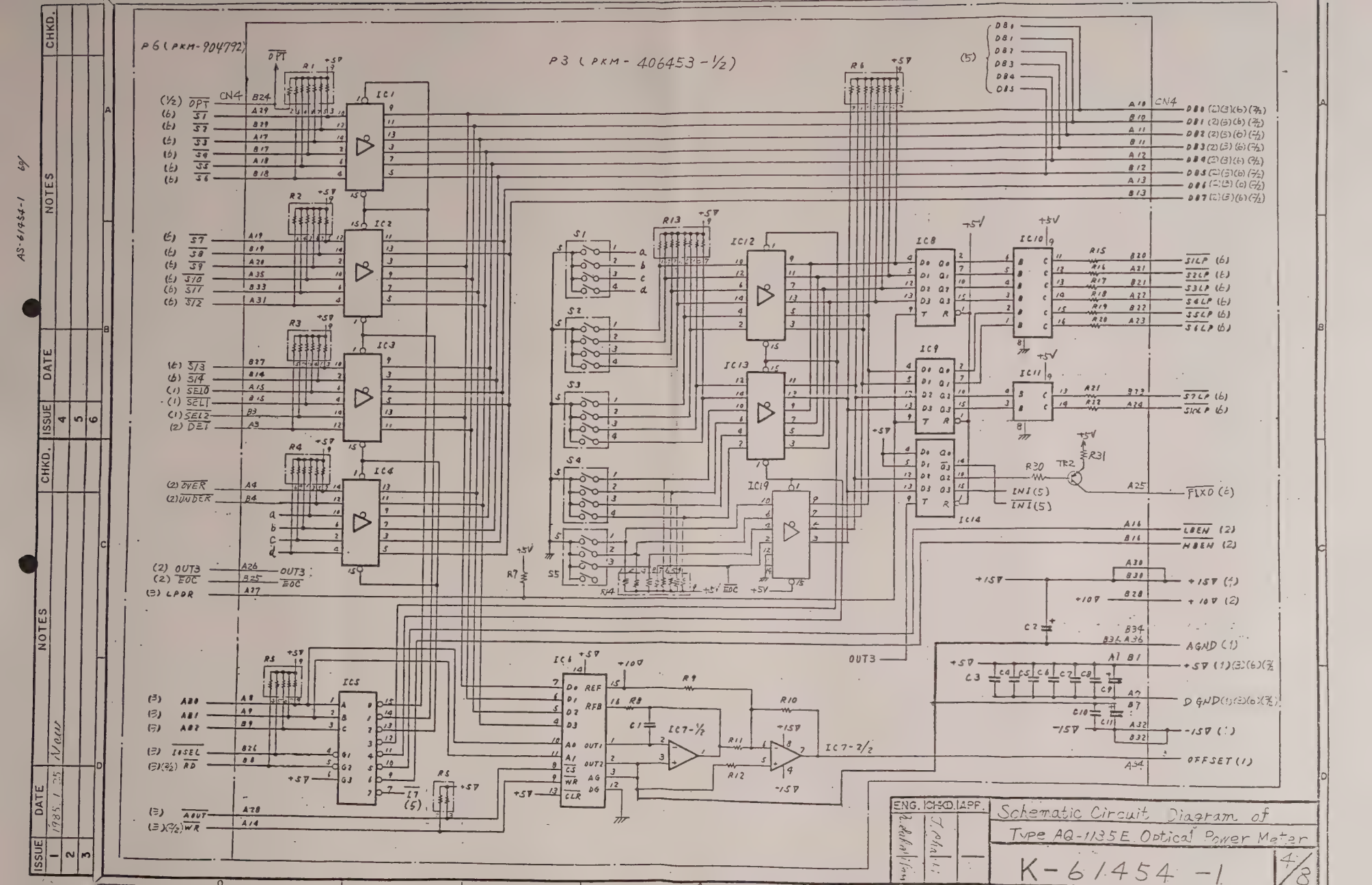
ENG.	CHKD.	APP.
T. Takaki		

Schematic Circuit Diagram of
Ivde AQ-1135E Optical Power Meter

K - 6 / 4 5 4 - 1 (3/8)


P6 (PKM-904792)
P3 (PKM-406453-1/2)
CN4
IC1
IC2
IC3
IC4
IC5
IC6
IC7-1/2
IC7-2/2
IC8
IC9
IC10
IC11
IC12
IC13
IC14
IC19
S1
S2
S3
S4
S5
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
R20
R21
R22
R23
R30
R31
TR2
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
OUT3
+5V
+15V
-15V
+10V
AGND (1)
DGND (1)(3)(6)(7½)
OFFSET (1)
LBEN (2)
HBEN (2)
FIXD (6)
INI (5)
EOC
DB0 (2)(3)(6)(7½)
DB1 (2)(3)(6)(7½)
DB2 (2)(3)(6)(7½)
DB3 (2)(3)(6)(7½)
DB4 (2)(3)(6)(7½)
DB5 (2)(3)(6)(7½)
DB6 (2)(3)(6)(7½)
DB7 (2)(3)(6)(7½)
S1LP (6)
S2LP (6)
S3LP (6)
S4LP (6)
S5LP (6)
S6LP (6)
S7LP (6)
S8LP (6)
OPT
S1
S2
S3
S4
S5
S6
S7
S8
S9
S10
S11
S12
S13
S14
SEL0
SEL1
SEL2
DET
OVER
UNDER
LPDR
RSEL
RD
WR
CS
CLR
LDAC
ABUT
ENG.
CHKD.
APP.
Schematic Circuit Diagram of
Type AQ-1135E Optical Power Meter
K-61454-1
4/8
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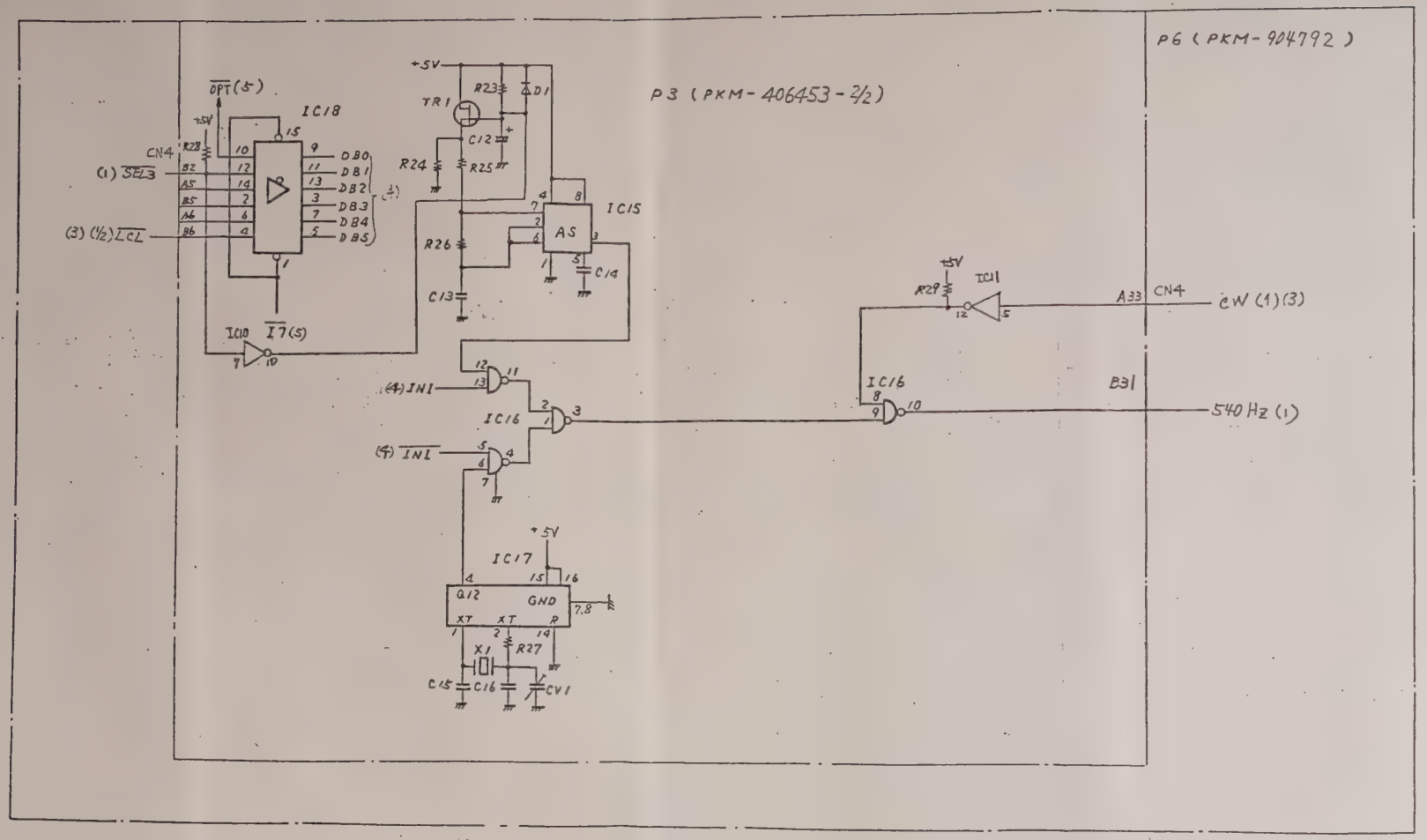

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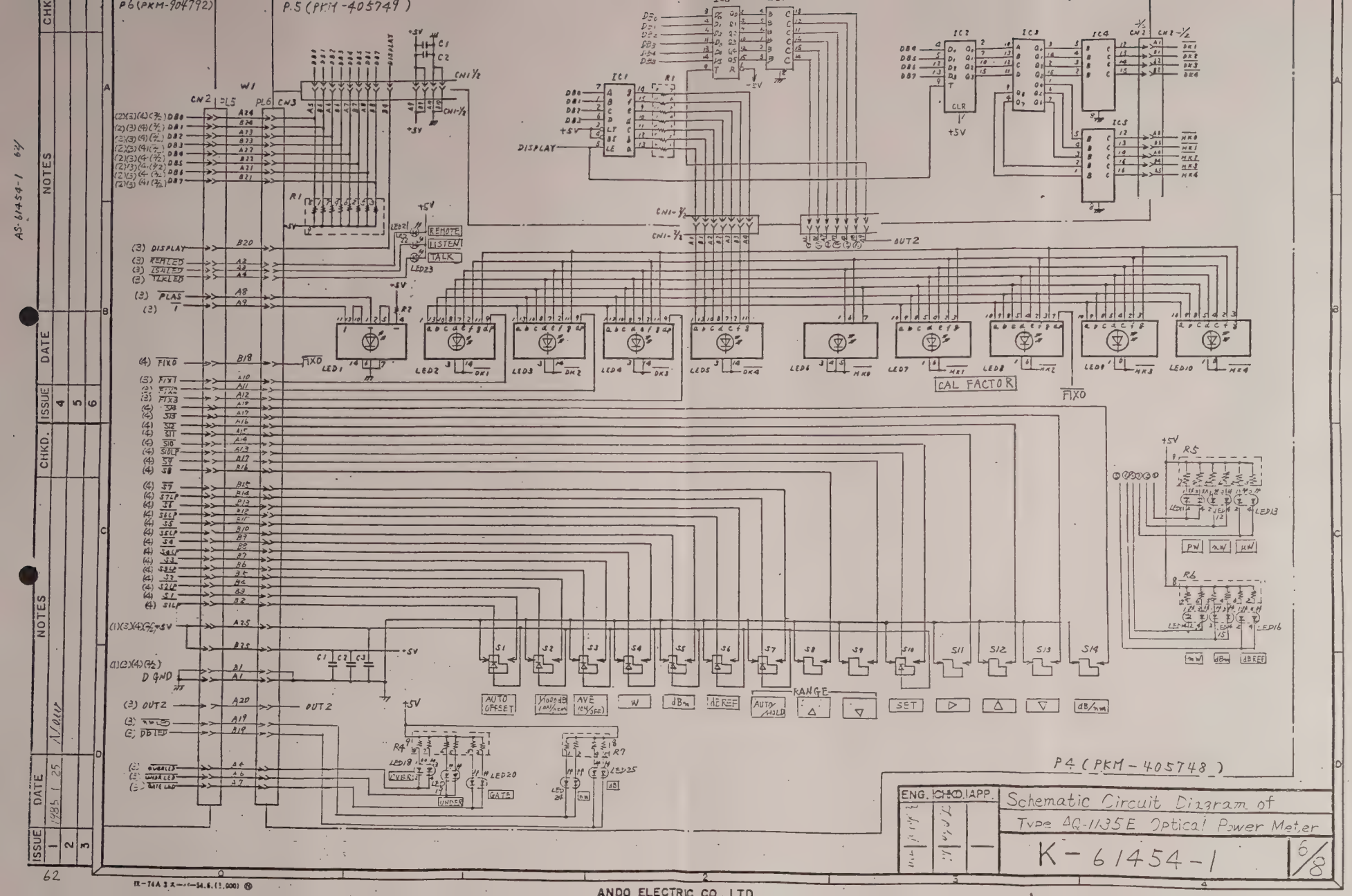
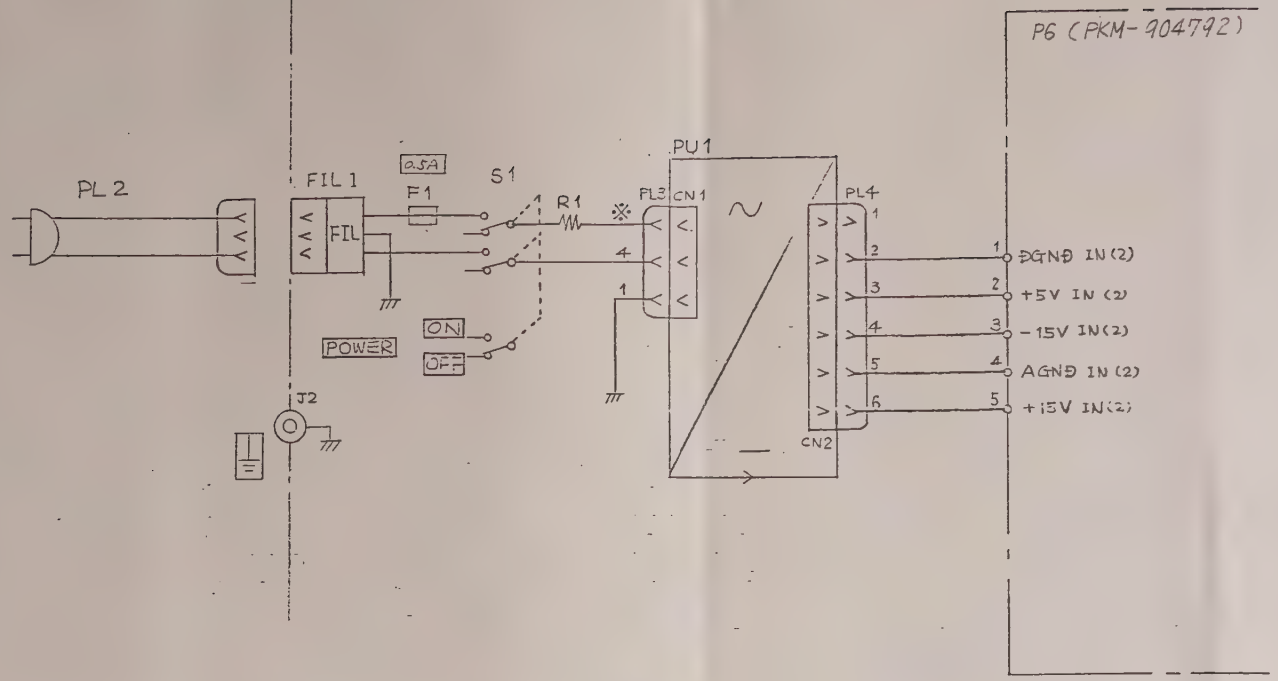
Schematic Circuit Diagram of
Type AQ-1135E Optical Power Meter

K-61454-1 5/6

ANDO ELECTRIC CO. LTD


P6(PKM-904792)
P.5(PKM-405749)
P4(PKM-405748)
CAL FACTOR
REMOTE
LISTEN
TALK
DISPLAY
OUT2
FIXO
AUTO OFFSET
W
dBm
dBREF
AUTO/HOLD
RANGE
SET
dB/REL
Schematic Circuit Diagram of
Type AQ-1135E Optical Power Meter
K-61454-1
6/8
ANDO ELECTRIC CO. LTD



※ AC 85 ~ 132 V : CN —「2」
AC 170 ~ 264 V : CN —「3」

ISSUE	DATE	NOTES	CHKD.
1	1985.1.25	Newer	
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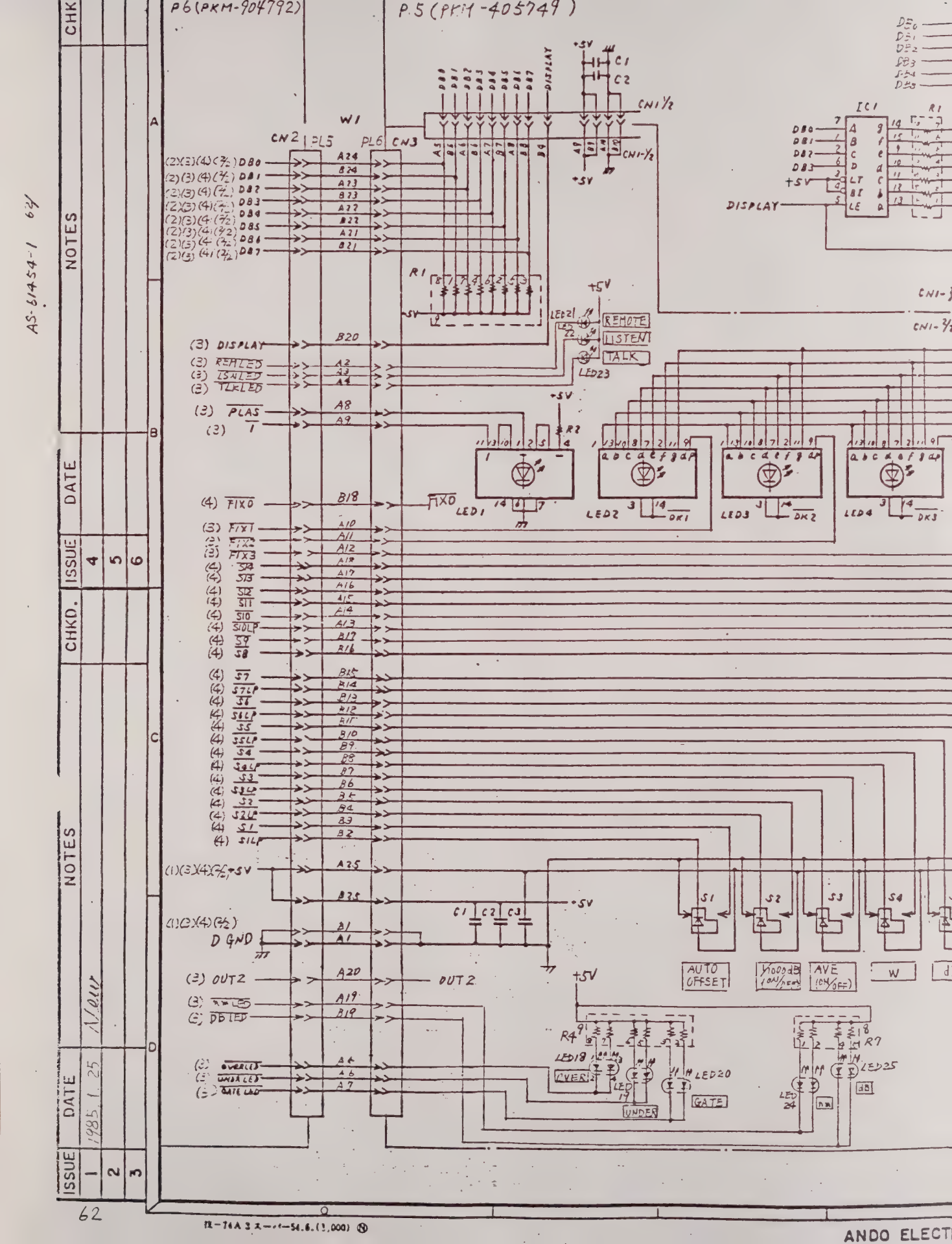
ENG.	CHKD.	APP.	Schematic Circuit Diagram of Type AQ-1135E Optical Power Meter
		—	K-61454-1 7/0


P6(PKM-904792)
P.5(PKM-405749)
CN2
PL5
PL6
CN3
W1
CN1-½
DISPLAY
REMOTE
LISTEN
TALK
LED21
LED23
LED1
LED2
LED3
LED4
FIX0
OUT2
D GND
+5V
AUTO OFFSET
AVE
W
LED18
LED19
LED20
LED24
LED25
OVER
UNDER
GATE
IC1
R1
R2
R4
R7
S1
S2
S3
S4
C1
C2
C3
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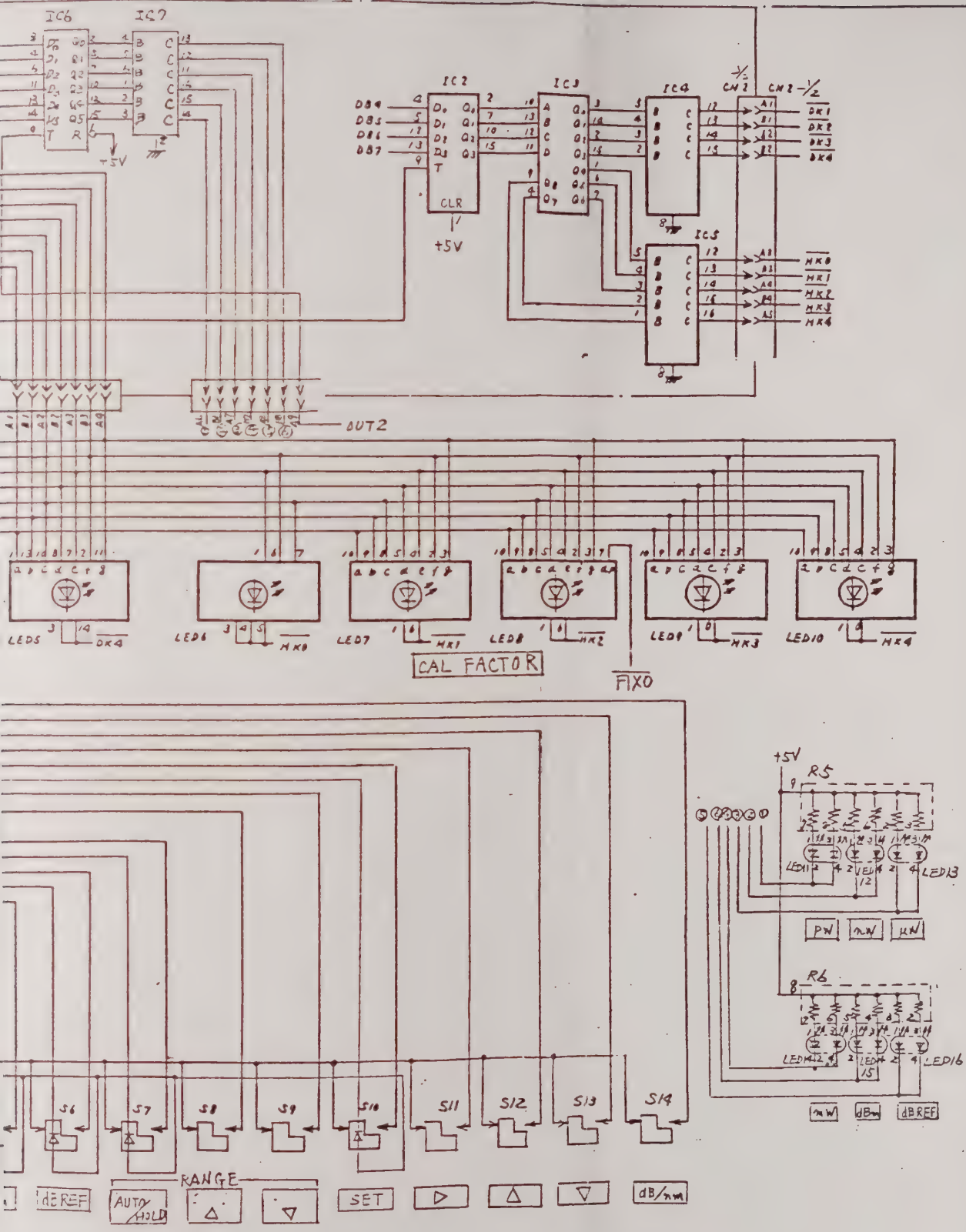

P4 (PKM-405748)

ENG.	CHKD.	APP.	Schematic Circuit Diagram of Type AQ-1135E Optical Power Meter	
		—	K-61454-1	6/8

ISSUE	DATE	NOTES	CHKD.
1	1985.1.25	New	
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ISSUE	DATE	NOTES	CHKD.
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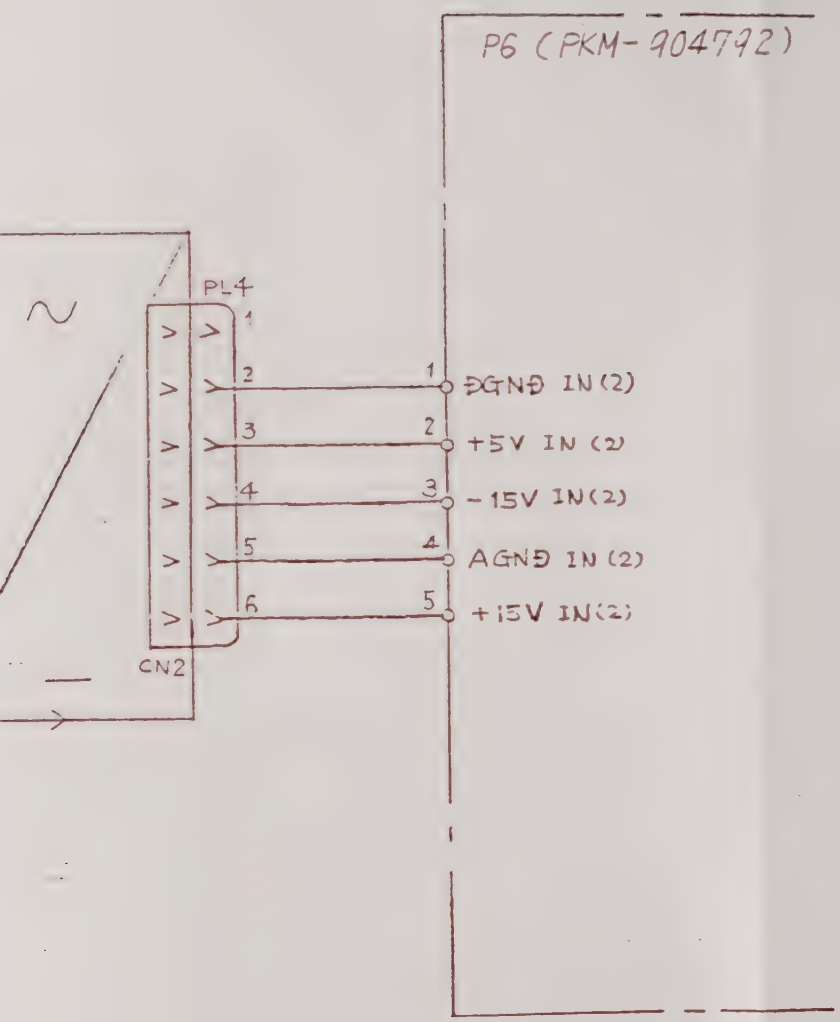
※ AC 85 ~ 132 V : CN —「2」
AC 170 ~ 264 V : CN —「3」



ENG.	CHKD.	APP.	Schematic Circuit Diagram of Type AQ-1135E Optical Power Meter	
		—	K-61454-1	7/8

Parts List

K-61454-1-8/8

Circuit Reference	Description	Mfr. Parts Number
F1	FUSE: 0.5 A	MF51NN250V0.5A
FIL1	FILTER	GL-2030F
J1	JACK	RG3B318C
J2	JACK	P12-01012B
P1	PRINTED CIRCUIT BOARD ASSEMBRY	PRE-904791
P2	PRINTED CIRCUIT BOARD ASSEMBRY	PRE-406452
P3	PRINTED CIRCUIT BOARD ASSEMBRY	PRE-406453
P4	PRINTED CIRCUIT BOARD ASSEMBRY	PRE-405748
P5	PRINTED CIRCUIT BOARD ASSEMBRY	PRE-405749
P6	PRINTED CIRCUIT BOARD ASSEMBRY	PRE-904792
PL1	PLUG	UM-QLP-1.5CR
PL2	POWER LINE CORD	
PL3	HOUSING	171141-1
PL4	HOUSING	171216-1
PL5	HOUSING	3425-6000SC
PL6	HOUSING	3425-6000SC
PL7	RECEPTACLE	PS-20SD-D4C2
PU1	POWER SUPPLY	LT-1A
R1	RES. FXD, MET CLAD; 10 Ω ±5% 10 W	RH-10
S1	SWITCH	M2022J(AT-450)
W1	CORD	

Parts List

ABBREVIATION

A:	ampere
ADJ:	adjustment
AL ELECT:	aluminum electrolytic
CAP:	capacitor
CB FLM:	carbon film
CER:	cermic
CMOS:	complementary metal-oxide semiconductor
F:	farad
FXD:	fixed
Hz:	hertz
IC:	integrated circuit
LED:	light-emitting diode
m:	meter (distance)
MET FLM:	metal film
NPN:	negative-positive-negative
RES:	resistor
SI:	silicon
V:	volt
VAR:	variable
W:	watt
WW:	wire wound
Ω:	ohm

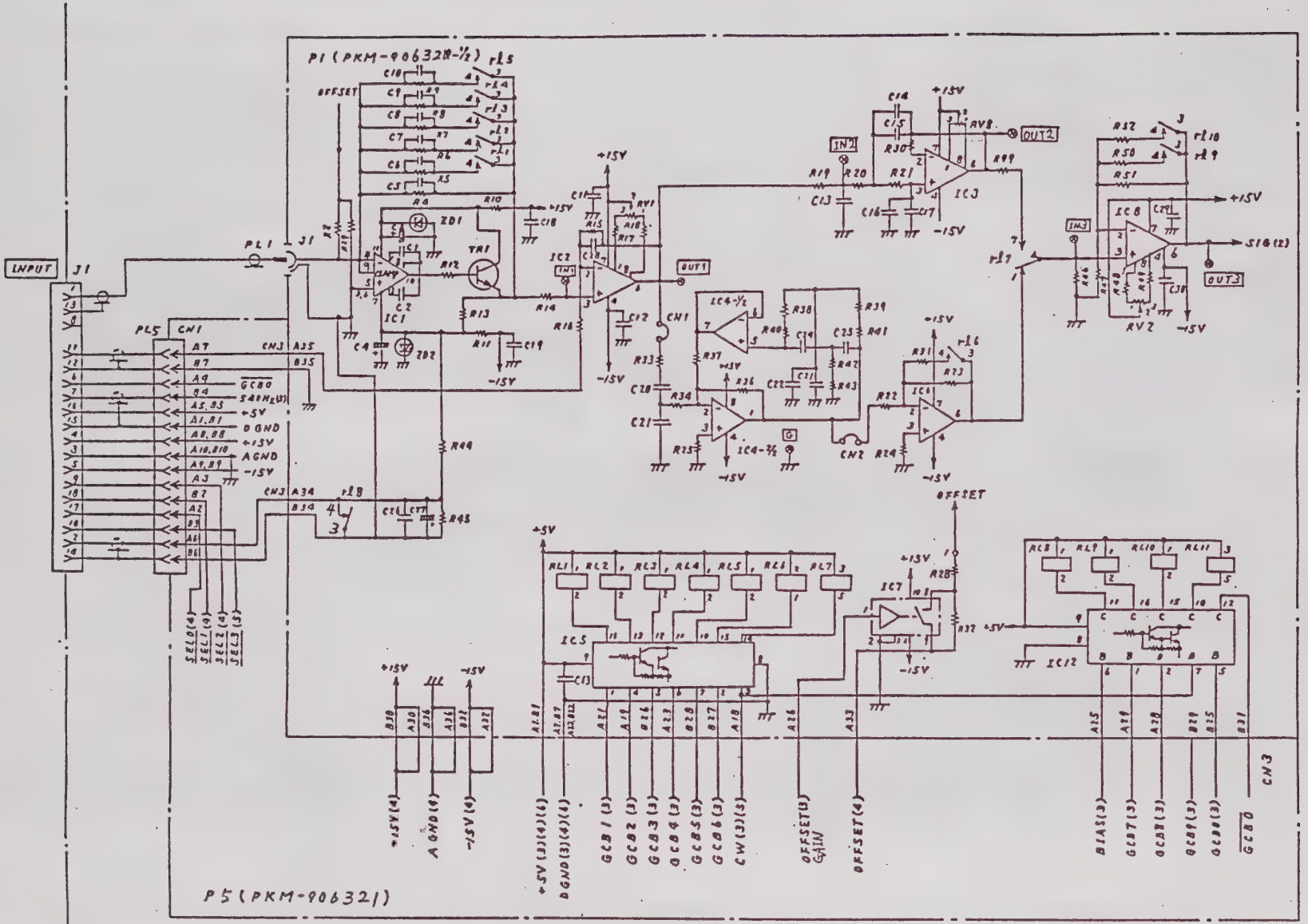
MULTIPLIERS

Abbreviation	Prefix	Multiple
G	giga	10^{9}
M	mega (meg)	10^{6}
K	kilo	10^{3}
m	milli	10^{-3}
μ	micro	10^{-6}
n	nano	10^{-9}
p	pico	10^{-12}

Parts List

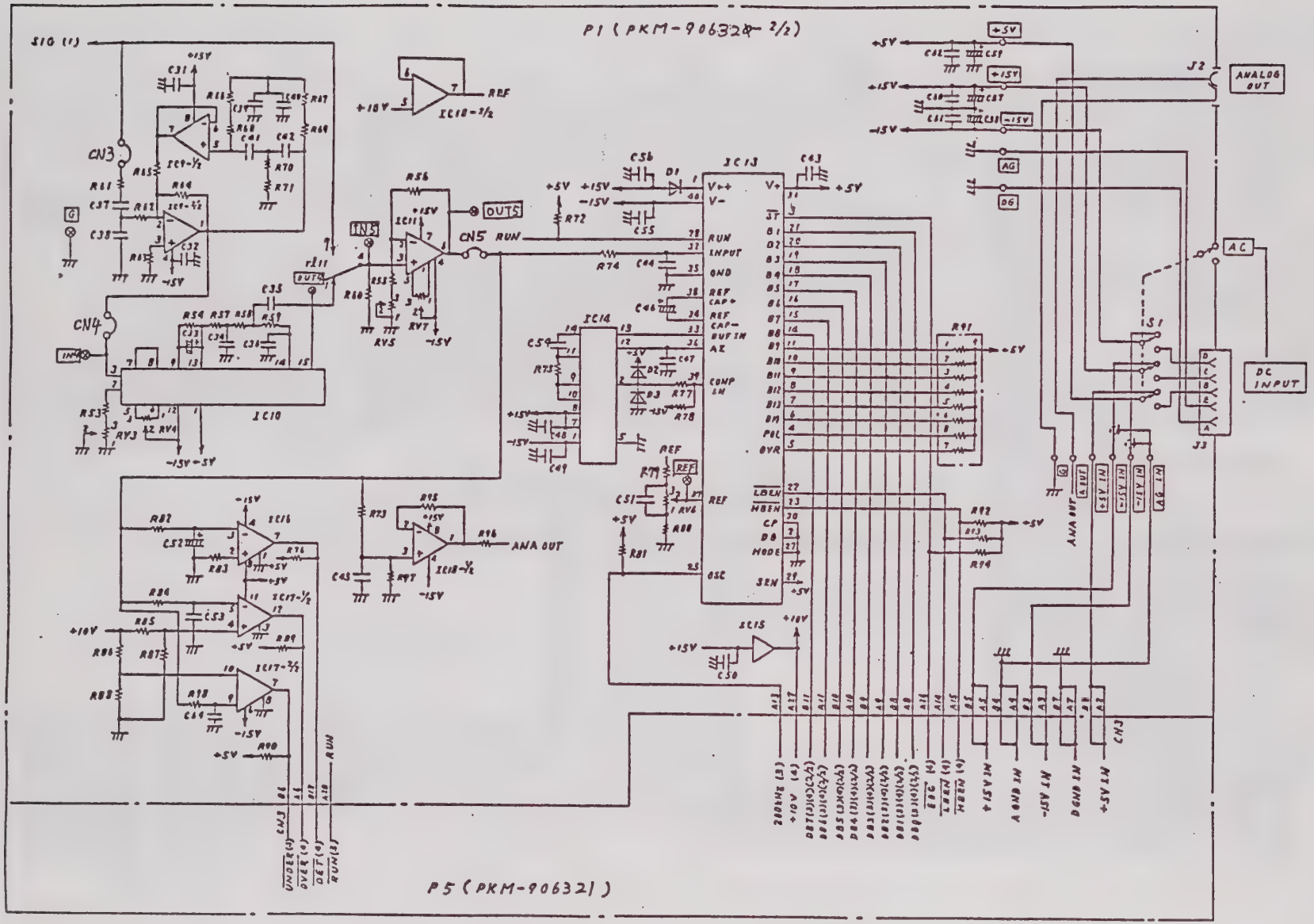
CIRCUIT REFERENCE

C: capacitor
CN: connector
F: fuse
IC: integrated circuit
LED: light-emitting diode
P: printed circuit boar
PS: power supply
R: resistor
RV: resistor, variable
S: switch
TR: transistor
X: crystal oscillator
ZD: zener diode



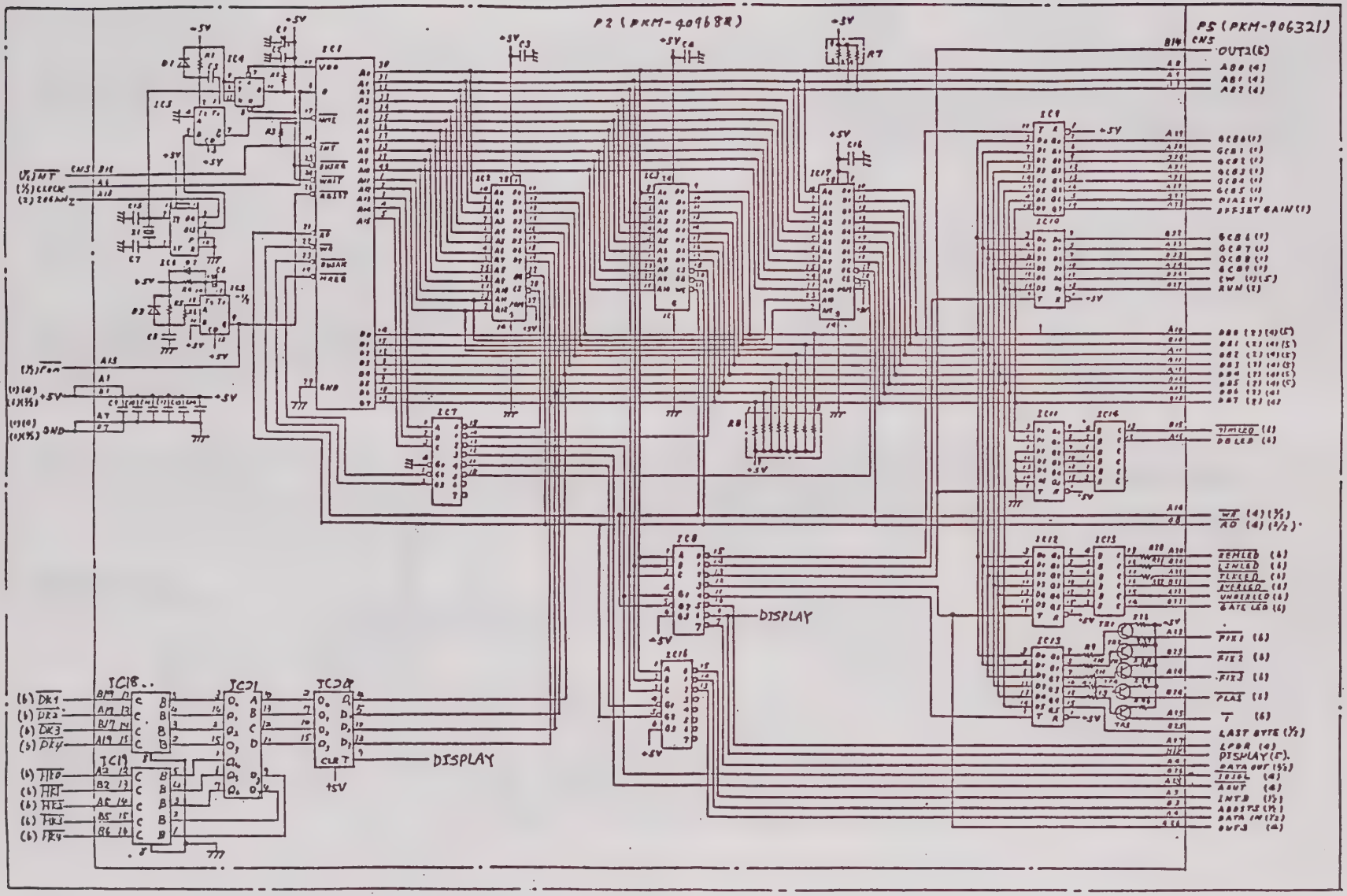
SCHEMATIC CIRCUIT DIAGRAM OF TYPE AQ-1135E OPTICAL POWER METER

K-61454-3



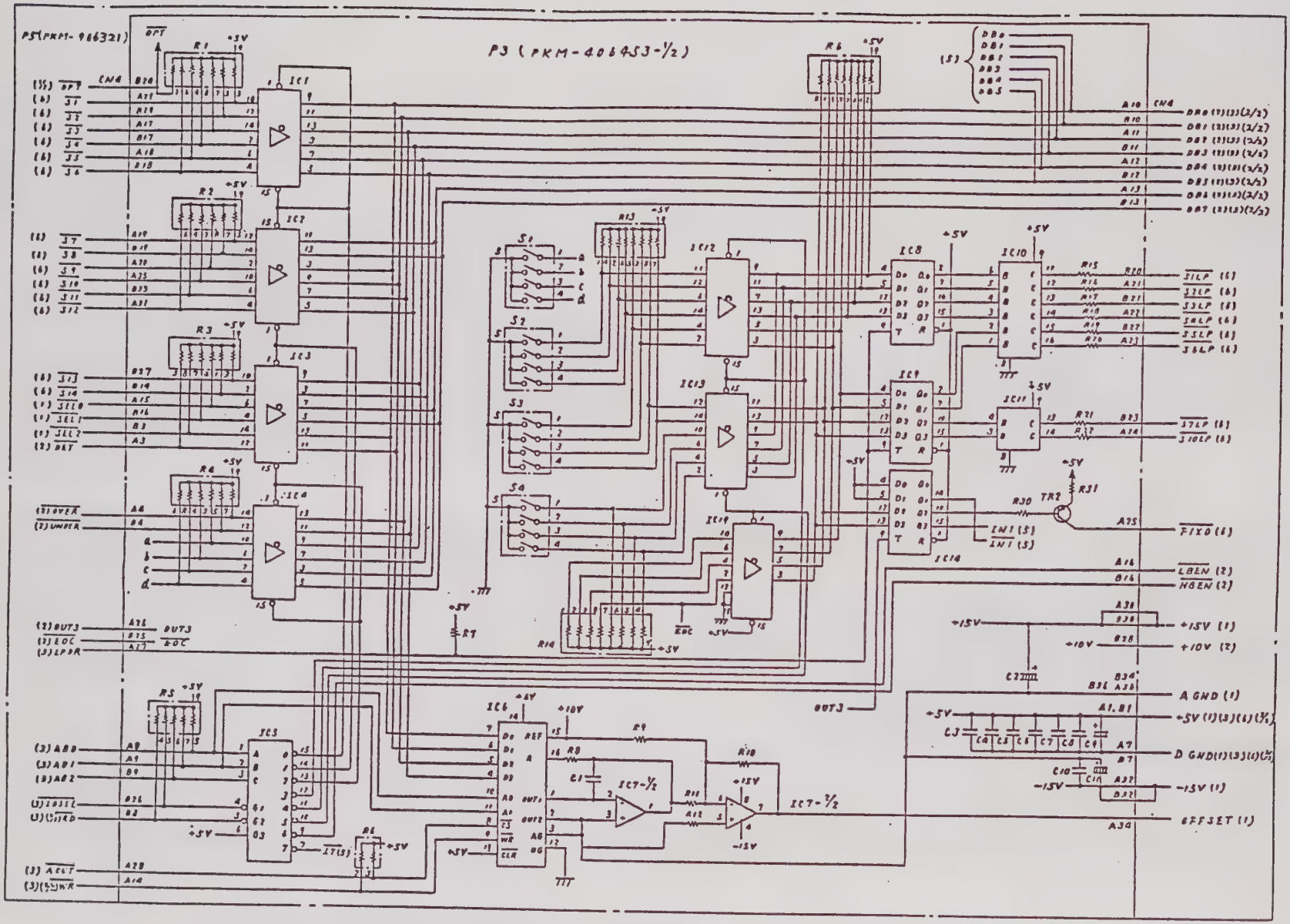
SCHEMATIC CIRCUIT DIAGRAM OF TYPE AQ-1135E OPTICAL POWER METER

K-61454-3-2

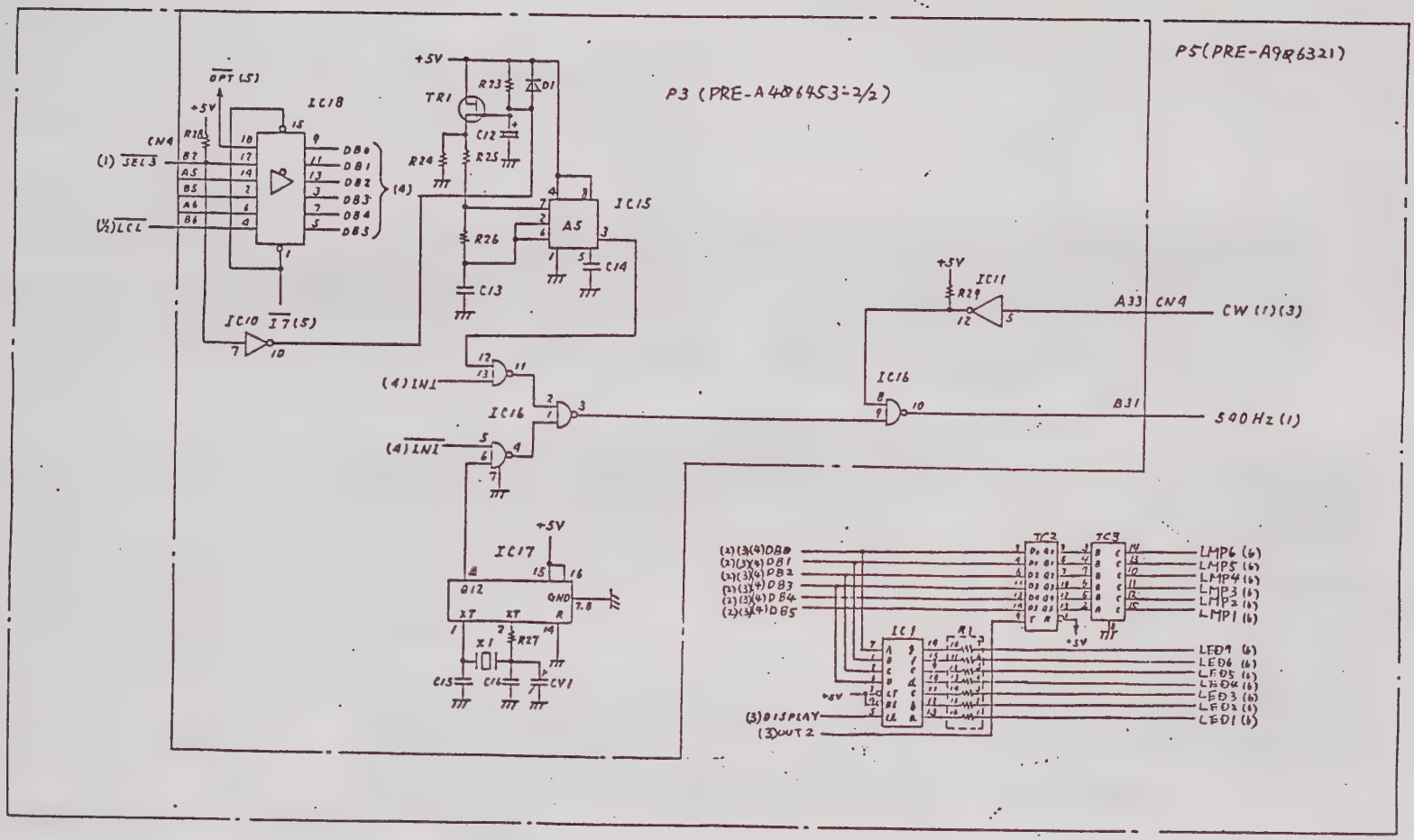


SCHEMATIC CIRCUIT DIAGRAM OF TYPE AQ-1135E OPTICAL POWER METER

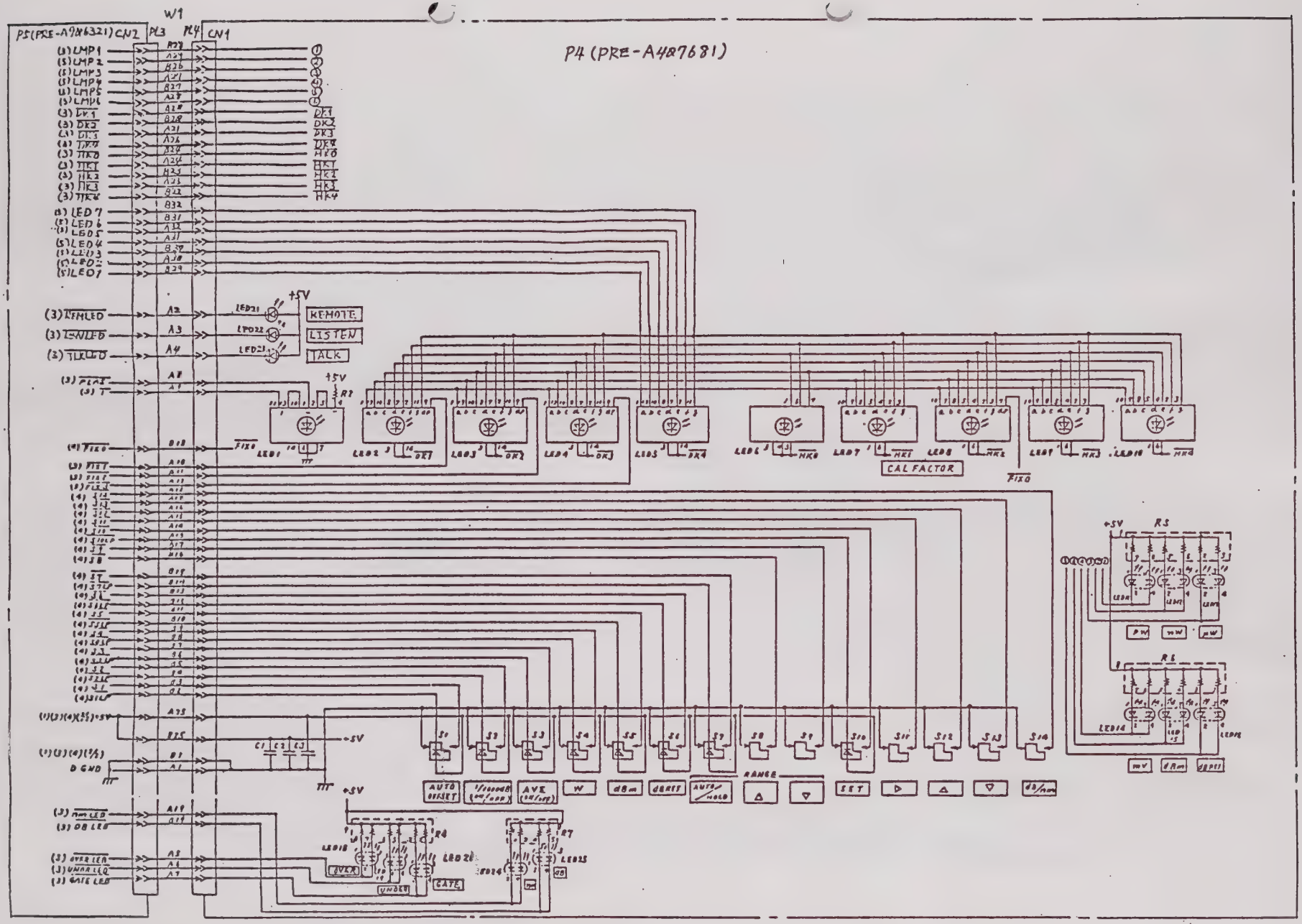
K-61454-3-



SCHAMATIC CIRCUIT DIAGRAM OF TYPE AQ-1135E OPTICAL POWER METER

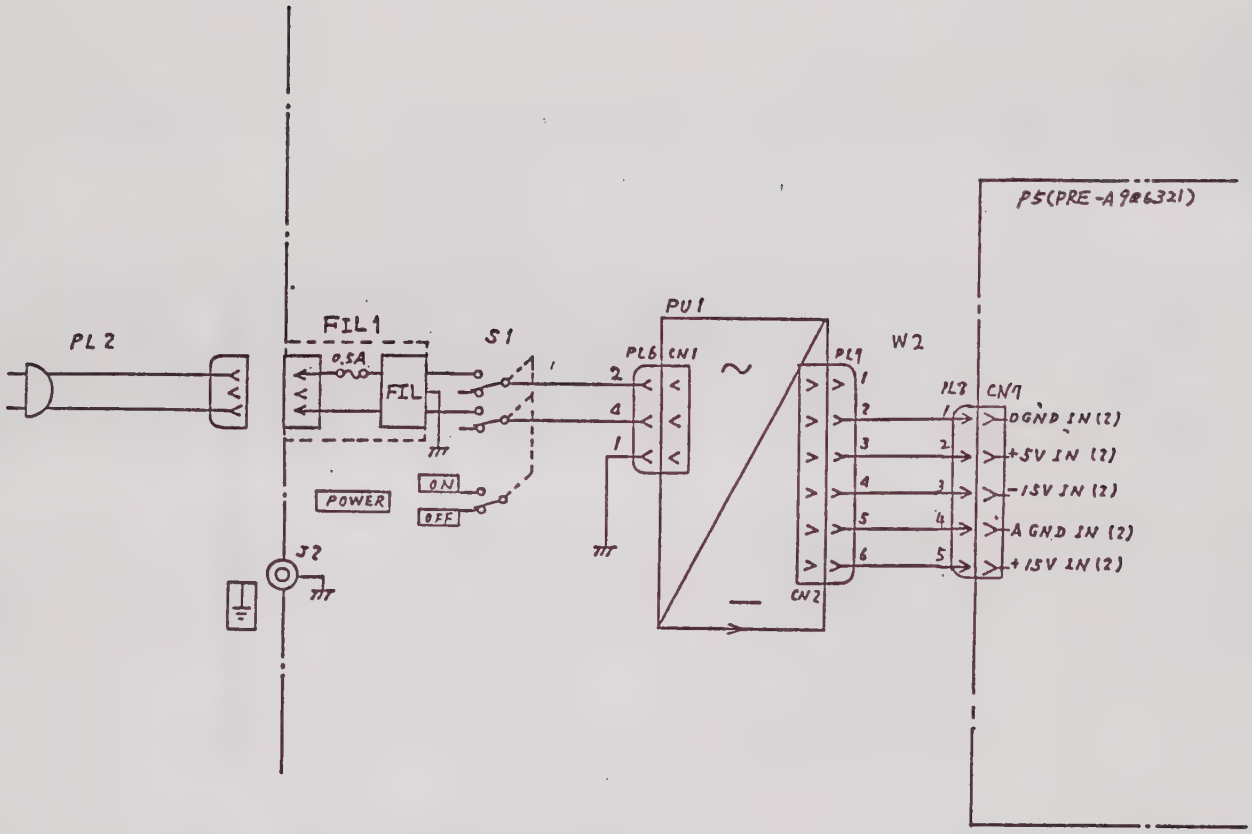


SCHEMATIC CIRCUIT DIAGRAM OF TYPE AQ-1135E OPTICAL POWER METER



SCHEMATIC CIRCUIT DIAGRAM OF TYPE AQ-1135E OPTICAL POWER METER

K-61454-3-6



SCHEMATIC CIRCUIT DIAGRAM OF TYPE AQ-1135E OPTICAL POWER METER.

K-61454-3-8/8

Circuit Reference	Description	Mfr. Parts Number
F1	FUSE: 0.5 A	ES2-0500
FIL1	FILTER	ZUB2203-00-F
J1	JACK	RG3B318C
J2	JACK	P12-01012B
P1	PRINTED CIRCUIT BOARD ASSEMBRY	PRE-906320
P2	PRINTED CIRCUIT BOARD ASSEMBRY	PRE-407680
P3	PRINTED CIRCUIT BOARD ASSEMBRY	PRE-406453
P4	PRINTED CIRCUIT BOARD ASSEMBRY	PRE-407681
P5	PRINTED CIRCUIT BOARD ASSEMBRY	PRE-906321
PL1	PLUG	UM-QLP-1.5CR
PL2	POWER LINE CORD	
PL3	HOUSING	FAS-64-02B
PL4	HOUSING	FAS-64-02B
PL5	RECEPTACLE	PS-20SD-D4C2
PL6	HOUSING	171141-1
PL7	HOUSING	171216-1
PL8	HOUSING	5058-05
PU1	POWER SUPPLY	LWT-1A
R1	RES. FXD, MET CLAD; 33Ω ±5% 10W	RH-10
S1	SWITCH	M2022J(AT-450)
W1	CORD	
W2	CORD	

Parts List

ABBREVIATION

A:	ampere
ADJ:	adjustment
AL ELECT:	aluminum electrolytic
CAP:	capacitor
CB FLM:	carbon film
CER:	cermic
CMOS:	complementary metal-oxide semiconductor
F:	farad
FXD:	fixed
Hz:	hertz
IC:	integrated circuit
LED:	light-emitting diode
m:	meter (distance)
MET FLM:	metal film
NPN:	negative-positive-negative
RES:	resistor
SI:	silicon
V:	volt
VAR:	variable
W:	watt
WW:	wire wound
Ω:	ohm

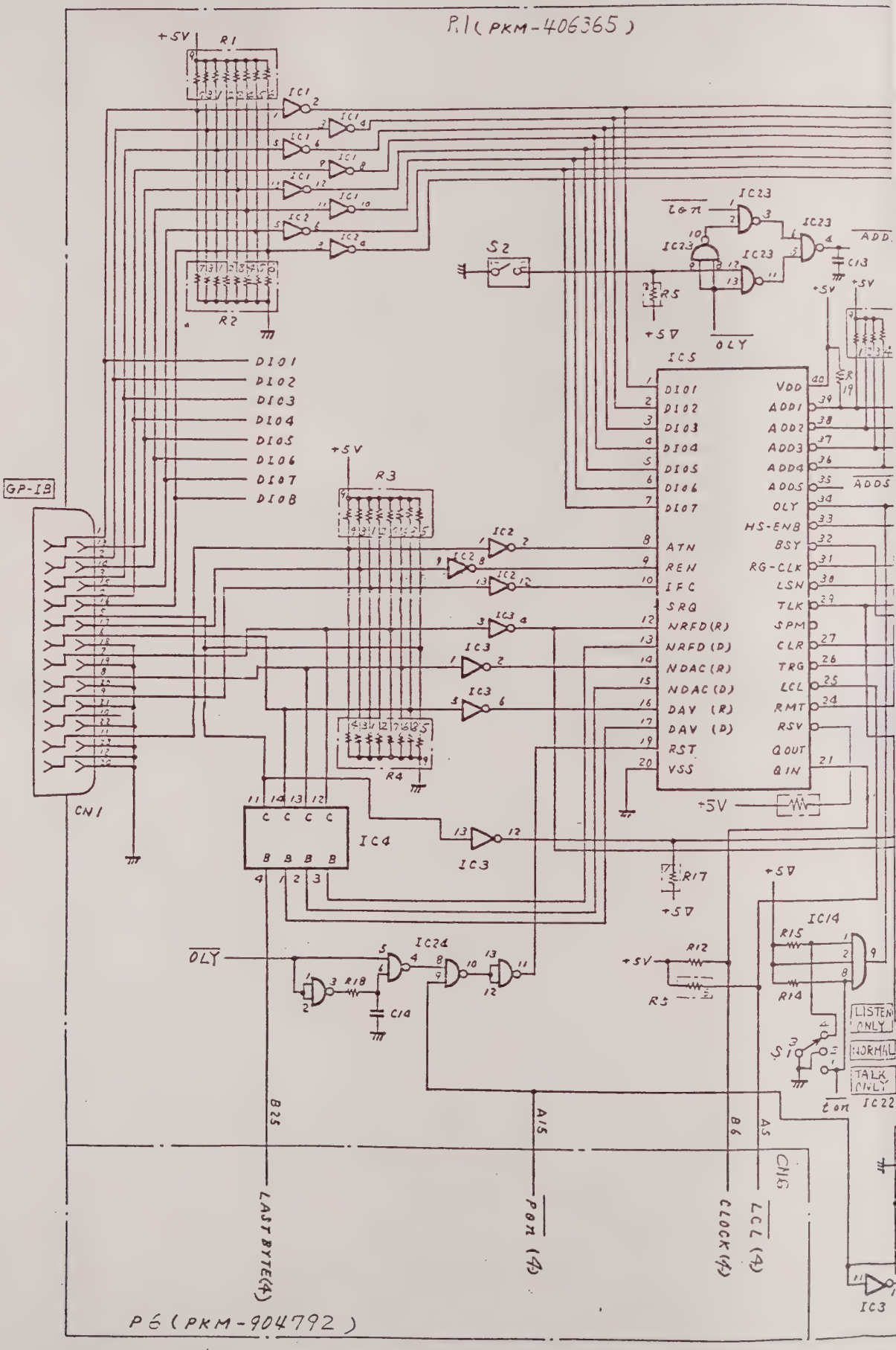
MULTIPLIERS

Abbreviation	Prefix	Multiple
G	giga	10^{9}
M	mega (meg)	10^{6}
K	kilo	10^{3}
m	milli	10^{-3}
μ	micro	10^{-6}
n	nano	10^{-9}
p	pico	10^{-12}

Parts List

CIRCUIT REFERENCE

C: capacitor
CN: connector
F: fuse
IC: integrated circuit
LED: light-emitting diode
P: printed circuit boar
PS: power supply
R: resistor
RV: resistor, variable
S: switch
TR: transistor
X: crystal oscillator
ZD: zener diode



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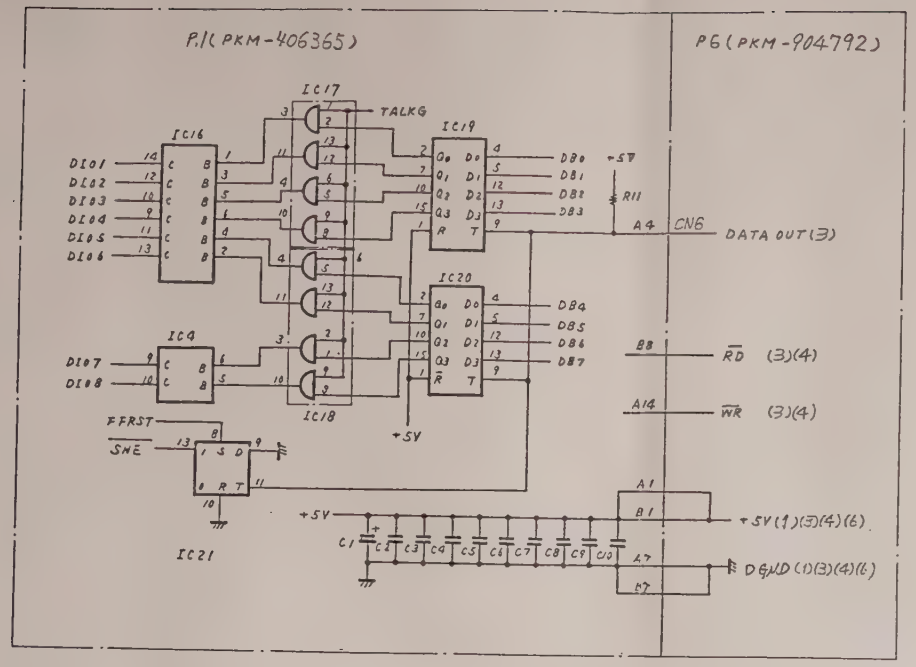

ENG.	CHKD.	APP.	Schematic Circuit Diagram of
		—	Type AD-1954E GP-TE Com
			K-61454-2 2/

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Parts List

K-61454-2-3/3

Circuit Reference	Description	Mfr. Parts Number
P1	PRINTED CIRCUIT BOARD ASSEMBLY	PRE-406365

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CHANGE NOTICE SUMMARY

Revision	Reason for Change	Date of Change